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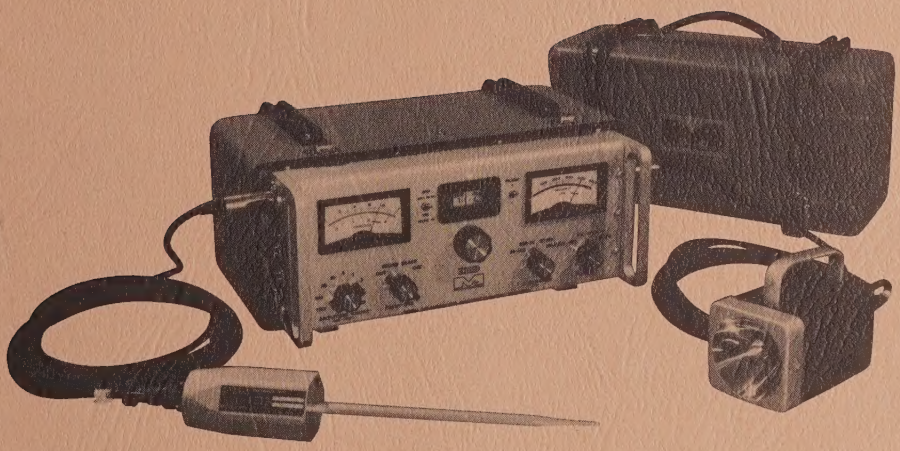

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SERVICE MANUAL FOR MODEL 350 VIBRATION ANALYZER/DYNAMIC BALANCER

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IRD MECHANALYSIS
SERVICE MANUAL
FOR
VIBRATION ANALYZER/DYNAMIC BALANCER
MODEL 350

MANUAL ITEM NO. 26971
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IRD Mechanalysis, Inc.
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INTRODUCTION

This Service Manual provides complete information for troubleshooting, servicing, and calibrating the Model 350 Vibration Analyzer. The information is divided into two chapters as follows:

Chapter I, CALIBRATION, provides complete set up instructions for calibrating the 350 circuits. At each step, the circuit calibration may be checked and corrected as needed.

Chapter II, SERVICE, provides complete information on the instrument circuits including Parts Lists, a Schematic Diagram, and a Block Diagram.

Appendix A consists of a listing of all changes and corrections included in the manual. The changes are keyed to the ECO (Engineering Change Order) number specifying or authorizing the change. The highest ECO number listed is keyed to the Prefix Letter listed on the face page of this manual.

CAUTION:

NO ATTEMPT TO CALIBRATE THIS UNIT SHOULD BE MADE EXCEPT BY AN EXPERIENCED, QUALIFIED TECHNICIAN, USING THE PROPER TEST EQUIPMENT. IRD MECHANALYSIS, INC. ASSUMES NO RESPONSIBILITY FOR THE OPERATION OF UNITS REPAIRED OR CALIBRATED OUTSIDE THE FACTORY OR CUSTOMER SERVICE AGENCIES.

I CALIBRATION

1.1 TEST EQUIPMENT REQUIRED

1) Digital Voltmeter (DVM) - Fluke 8050A or equivalent.

2) Scope - Tektronics 503 or equivalent.

3) Signal Generator - Wavetec 184 or equivalent.

4) Frequency Counter - HP5302A or equivalent.

5) PC Board Extender - Part No. 9520.

6) Recorder - IRD Mechanalysis Model 1080, Part No. 18323.

7) Recorder Input Cable - Part No. 11866.

8) 350 Spectrum Analyzer Sheets - Part No. 10601.

9) Model 544 Strobe Light (Part No. 8650) and Strobe Light Cable (Part No. 8653).

10) Pickup Input Cable Connector - Part No. 4637.

1.2 PRELIMINARY INSTRUMENT SETUP

Calibration of the Model 350 requires the adjustment of various internal controls. To gain access to these controls, the instrument case must be separated from the chassis. To accomplish this, remove the six (6) screws securing the case, then slide the case from the instrument.

The locations of the calibration controls and test points are shown following in Figure 1-1, Page 1-2. This layout drawing should be referred to throughout the calibration procedure. The control or test point reference numbers follow the component series number designation for each PC Board (e.g., all components on the Logic PC Board have 400 series numbers, etc.).

NOTE: Both 350 meters should be properly zeroed before the instrument is calibrated.

CAUTION: High voltages are present on exposed terminals of the PC boards and chassis. Care should be exercised when making circuit connections or performing voltage measurements.

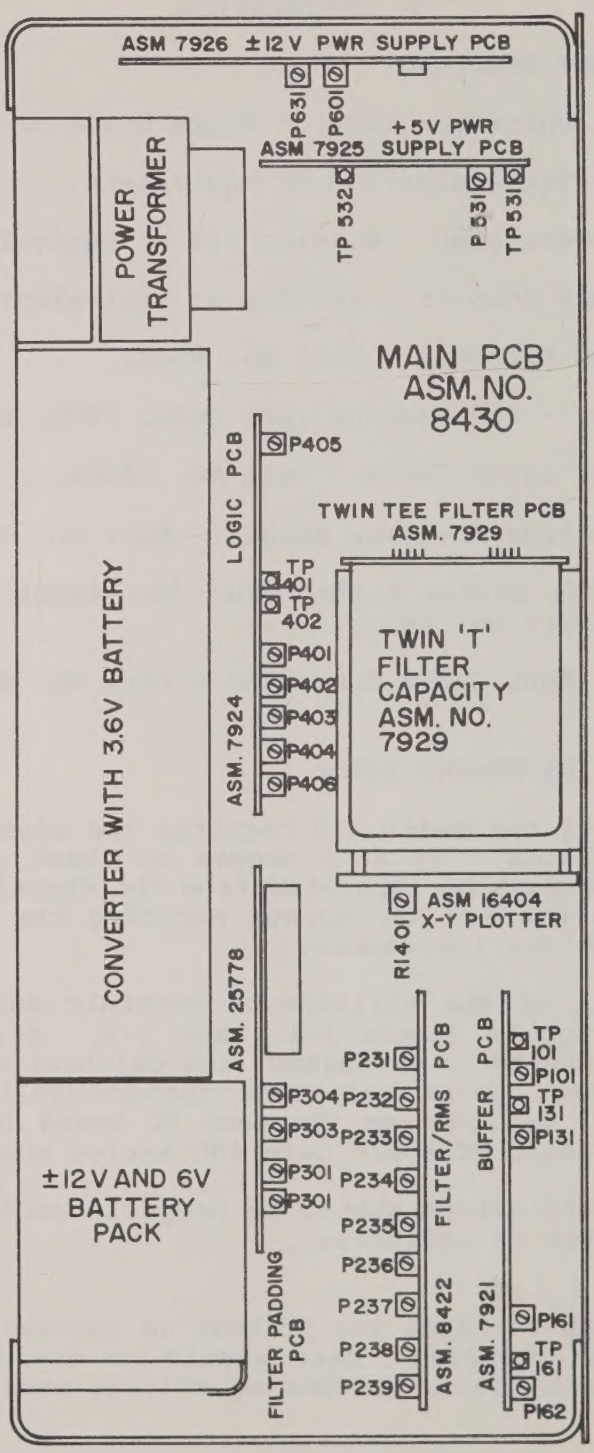


FIGURE 1-1 CALIBRATION CONTROL AND TEST POINT LOCATIONS

1.3 INSTRUMENT TEST CONNECTIONS

The Signal Generator and the Digital Voltmeter (DVM) may be connected to the 350 input using a suitable connector/cable assembly as shown below in Figure 1-2

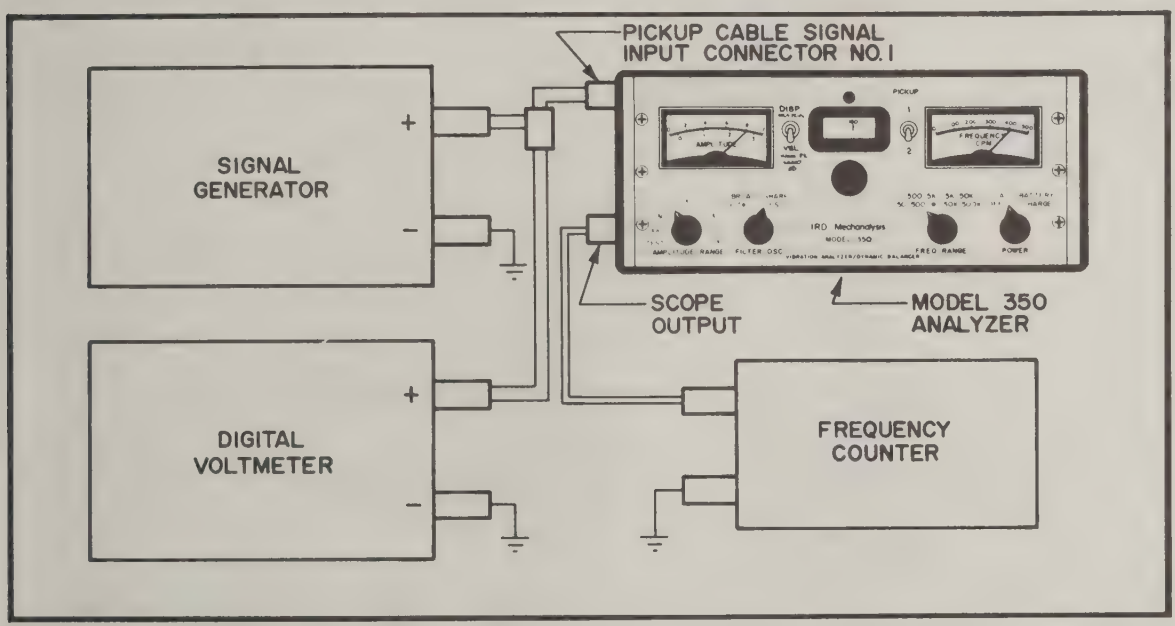


FIGURE 1-2 TYPICAL INSTRUMENT INPUT CONNECTION

The Signal Generator and DVM connecting cables must be shielded and not excessively long. The Frequency Counter should be connected to the 350 SCOPE output fitting, and the Model 544 Strobe should be connected to the STROBE LIGHT receptacle.

1.4 POWER SUPPLY TEST AND CALIBRATION

1. Connect AC power to the 350 instrument and set the POWER switch to "AC." Measure and calibrate the power supply voltages as listed below in Table 1-1. The +13 and -13 VDC test points are located on the bottom of the Main PC Board, as shown in Figure 1-3, Page 1-4.

TABLE 1-1 POWER SUPPLY CALIBRATION

DVM (-) LEAD	DVM (+) LEAD	ADJUSTMENT CONTROL	DC VOLTAGE VALUE
Chassis Grnd.	±13 VDC PBC Conn. - Pin 22	P601	+13.5 ±0.1 Volts
Chassis Grnd.	±13 VDC PBC Conn. - Pin 12	P631	-13.5 ±0.1 Volts
TP-532	TP-531	P531	+ 5.1 ±0.1 Volts

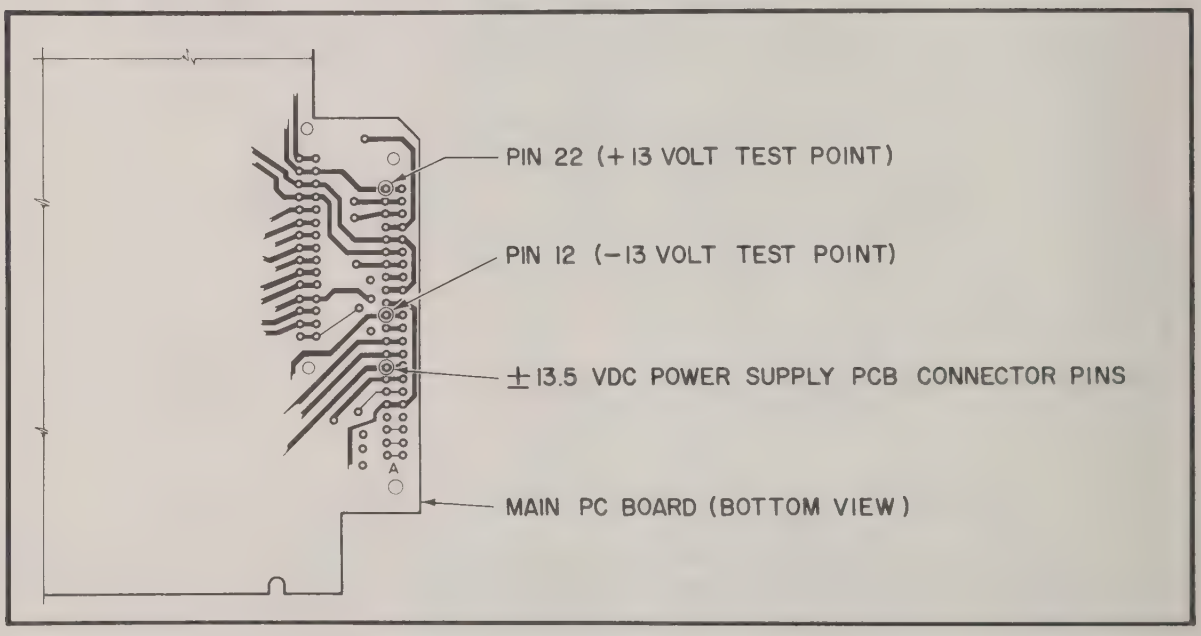


FIGURE 1-3 ±13 VOLT TEST POINTS

2. Disconnect the AC power to the 350 instrument. Connect the DVM to the test points indicated in Figure 1-4 below. CAUTION: High voltage may be present at these points after the AC power is disconnected.

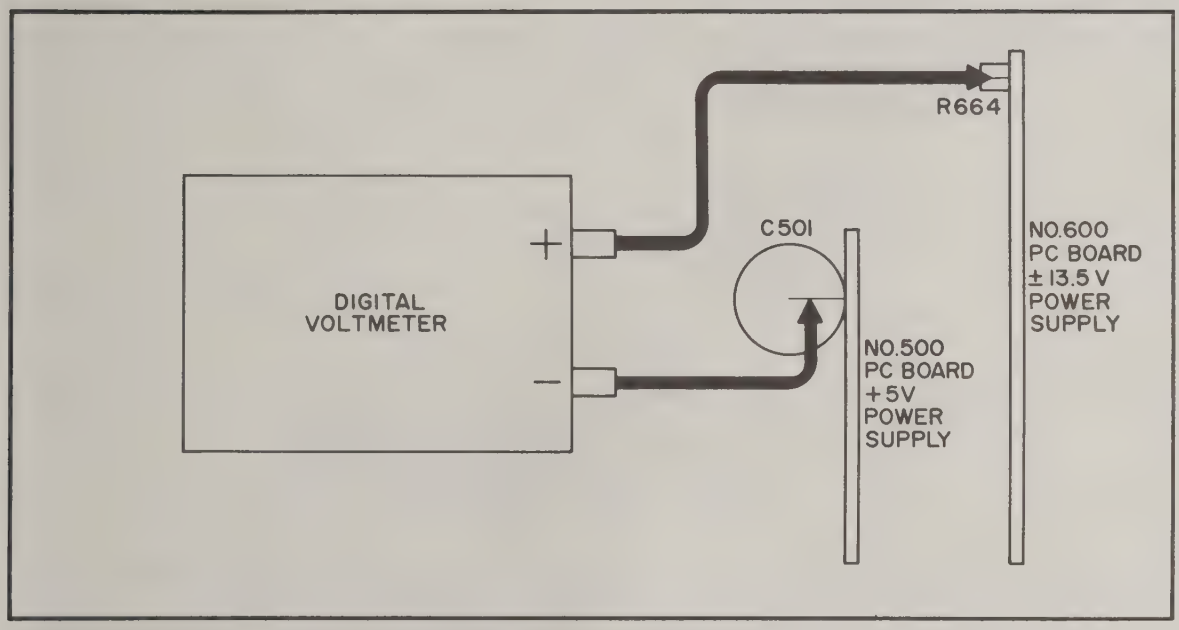


FIGURE 1-4 HIGH VOLTAGE SUPPLY TEST POINTS

3. For each setup located in Table 1-2 below, measure the DC voltage between the test points shown in Figure 1-4 above.

TABLE 1-2 350 HIGH VOLTAGE TEST

INSTRUMENT SETUP	REQUIRED DC VOLTAGE VALUE
POWER SWITCH - "AC" STROBE LIGHT - "OFF"	+450 to +500 VOLTS
POWER SWITCH - "BATT" STROBE LIGHT - "ON"	+400 to +500* VOLTS
AMPLITUDE RANGE - "100" (STROBE MUST NOT FIRE)	+450 to +500* VOLTS

* This voltage depends on the condition of the internal battery.

4. Disconnect the AC power and remove the DVM test leads.

1.5 BUFFER-INTEGRATOR CALIBRATION

1. Set up the 350 controls as follows:

350 CONTROL	CONTROL SETTING
POWER	"AC"
PICKUP INPUT	No. 1
AMPLITUDE RANGE	"1"
FILTER-OSC	"OUT"
FREQ. RANGE	"5K - 50K"
DISP/VEL	"VEL"

2. Adjust the signal generator for an output of 764 mV RMS at 100 Hz. Connect a second DVM as follows:

(+) LEAD - TP101
(-) LEAD - CHASSIS GRND.

3. Adjust P101 for a reading of 7.64 mV RMS on the DVM.

4. Adjust P231 for a full scale reading on the 350 Amplitude meter.

5. Set the AMPLITUDE range control to "3" and the DISP/VEL switch to "DISP". Adjust P131 for a full scale reading on the Amplitude meter.

1.6 FILTER AND FREQUENCY METER CALIBRATION

1. Set up the 350 controls as follows:

350 CONTROL	CONTROL SETTING
AMPLITUDE RANGE	"1"
FILTER-OSC	"OUT"
FREQ. RANGE	"50K - 500K"
DISP/VEL	"VEL"

2. For each Frequency Range setting in Table 1-3 below, adjust the signal generator to obtain an Amplitude Meter reading of .9 at the frequency listed in the FILTER-OUT mode. Then, tune the filter for a peak meter reading in the SHARP and BROAD modes. Adjust the corresponding control for each mode setting as indicated to obtain a meter reading of .9.

TABLE 1-3 FILTER IN AMPLITUDE CALIBRATION

FREQ RANGE	GEN FREQ	FILTER MODE	CONTROL REF. NO.	METER READING
50K - 500K	1KHz	OUT		.9
		SHARP - TUNE TO PEAK	P239	"
		BROAD - TUNE TO PEAK	P235	"
5K - 50K	100Hz	OUT		.9
		SHARP - TUNE TO PEAK	P238	"
		BROAD - TUNE TO PEAK	P234	"
500 - 5K	10Hz	OUT		.9
		SHARP - TUNE TO PEAK	P237	"
		BROAD - TUNE TO PEAK	P233	"
50 - 500	2Hz	OUT		.9
		SHARP - TUNE TO PEAK	P236	"
		BROAD - TUNE TO PEAK	P232	"

3. For each generator frequency listed in Table 1-4 below, set up the 350 FREQ RANGE and FILTER-OSC controls as specified, and adjust the generator output level for an Amplitude Meter reading of .9 in the FILTER-OUT mode. When the FILTER is in the SHARP mode, it should be carefully tuned to the peak before adjusting the corresponding calibration control.

TABLE 1-4 FREQUENCY METER AND FILTER CALIBRATION

GEN FREQ	FREQ RANGE	FILTER MODE	CONTROL REF. NO.	AMPLITUDE METER	FREQ METER
8KHz	5K- 50K	OUT		.9	
		"	P405	---	*
	50K- 500K	"	P404	---	480
		SHARP	R304	.9	
800 Hz	5K- 50K	OUT		.9	
		"	P403	---	480
		SHARP	P303	.9	
80 Hz	500- 5K	OUT		.9	
		"	P402	---	480
		SHARP	P302	.9	
8 Hz	50- 500 Hz	OUT		.9	
		"	P401	---	480
		SHARP	P301	.9	

* Adjust P405 for a slightly overscale reading. The meter needle should not be pegged.

4. Repeat Steps 2 and 3 as needed to obtain consistent meter readings.

1.7 DISPLACEMENT FREQUENCY RESPONSE

1. Set up the 350 controls as follows:

350 CONTROL	CONTROL SETTING
FILTER-OSC	"OUT"
FREQ. RANGE	"5K - 50K"
AMPLITUDE RANGE	"1"
DISP/VEL	"DISP"
POWER	"AC"
PICKUP	No. 1

2. Adjust the signal generator for an output of 216 mV RMS at 100 Hz.

3. Adjust P131 for an Amplitude meter reading of .9. Set the 350 POWER switch to "BATTERY". The Amplitude meter must indicate a reading of .87 to .93.

4. Set the POWER switch to "AC", the DISP/VEL switch to "VEL", and the AMPL. RANGE switch to ".3".

5. Adjust P101 for an Amplitude meter reading of .9.

1.8 TEST CALIBRATIONS

1. Set up the 350 controls as follows:

350 CONTROL	CONTROL SETTING
POWER	"AC"
AMPL. RANGE	"TEST"
FILTER-OSC	"OUT"
DISP/VEL	"DISP"
FREQ. RANGE	"500 - 5K"

2. Adjust P162 for an Amplitude meter reading of .9.

3. Adjust P161 for a 350 Frequency meter reading of 400.

4. Set the POWER switch to "BATTERY". Both 350 meters should indicate a reading in the green test area.

1.9 STROBE SCALING AND SENSITIVITY

1. Set up the 350 controls as follows:

350 CONTROL	CONTROL SETTING
AMPL. RANGE	"1"
DISP/VEL	"VEL"
FILTER-OSC	"OUT"
FREQ. RANGE	"5K - 50K"
POWER	"AC"

2. Adjust the signal generator as follows, using the frequency counter connected to the 350 SCOPE output fitting to monitor the frequency. The STROBE light should be switched to OFF.

GENERATOR FREQUENCY - 250 ±1 Hz

350 AMPLITUDE METER - .9

3. Connect the scope input to the test point depicted in Figure 1-5 below. A card extender may be used to facilitate this connection to the PC Board. A square wave should be observed on the scope.

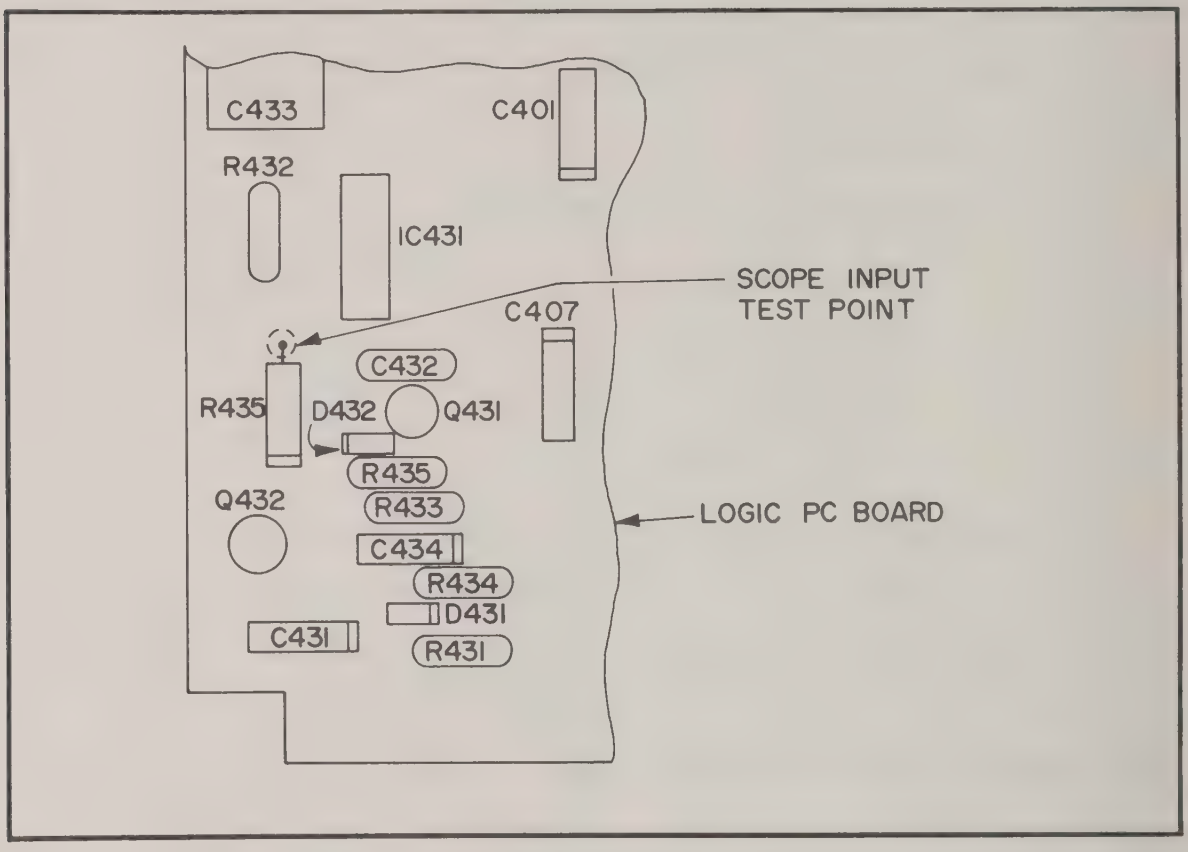


FIGURE 1-5 SCOPE INPUT TEST POINT

4. Slowly adjust P406 until the duty cycle of the square wave narrows to a thin line and becomes jittery, and then jumps into a square wave again. Reverse the adjustment of P406 until the square wave again narrows to a thin line with jitter.

5. Switch the strobe light power to ON, then decrease the signal generator output level to zero. The Strobe should stop firing.

6. Slowly increase the signal generator amplitude until the strobe light starts to fire. At this point, the 350 Amplitude meter should indicate a reading of 5% to 10% of full scale.

1.10 FILTER DIAL CALIBRATION

1. Set up the 350 controls as follows:

350 CONTROL	CONTROL SETTING
POWER	"AC"
DISP/VEL	"VEL"
FREQ. RANGE	"500 - 5K"
FILTER-OSC	"OUT"
AMPL. RANGE	"1"

2. Adjust the signal generator as follows, using the frequency counter connected to the 350 SCOPE output receptacle to monitor the frequency. The STROBE light should be switched to OFF.

GENERATOR FREQUENCY - 50 ±.5 Hz

350 AMPLITUDE METER - .9

3. Set the FILTER-OSC control to "SHARP," and carefully tune the filter for a peak Amplitude meter reading.

4. If necessary, align the tuning dial to exactly "300" as follows:

   a) Separate the tuning knob and the plastic grommet from the shaft.

   b) Loosen (but do not remove) the two screws securing the plastic dial, and move the dial as needed.

   c) Tighten the two screws and retune the filter to check the dial alignment.

1.11 RECORDER FREQUENCY ALIGNMENT CALIBRATION:

1. Set up the 350 controls as follows:

350 CONTROL	CONTROL SETTING
POWER	"AC"
DISP/VEL	"VEL"
FREQ. RANGE	"500 - 5K"
AMPL. RANGE	".3"
FILTER-OSC	"OUT"

2. Connect the signal generator to the No. 1 pickup input. Adjust the generator as follows, using the frequency counter connected to the 350 SCOPE output fitting to monitor the frequency.

GENERATOR FREQUENCY - 20 Hz

350 AMPLITUDE METER - Full Scale

3. Using the appropriate cables, connect the 1080 recorder to the 350 "X" and "Y" output receptacles. Place a blank 350 Spectrum Analysis sheet on the recorder.

4. Set up the 1080 controls as follows:

1080 Control	CONTROL SETTING
PEN	"LIFT"
SERVO	"ON"
LINE	"ON"

5. Set the 350 PICKUP switch to No. 2, and calibrate the 1080 X-ZERO and X-FULL SCALE controls as follows:

a) Set the 350 filter dial to exactly "50" on the low end of the scale. Adjust the X-ZERO control to align the pen with the 500 line on the sheet. Jog the PEN switch to RECORD to mark the sheet.

b) Set the 350 filter dial to exactly "500" on the high end of the scale. Adjust the X-FULL SCALE control to align the pen to the 5K line on the sheet. Jog the PEN switch to mark the sheet.

c) Adjust the Y-ZERO control to align the pen with the Zero Amplitude line on the Sheet. Set the PICKUP switch to No. 1, then adjust the Y-FULL SCALE control to align the pen with the Full Scale line. For each adjustment of the Y-ZERO and Y-FULL SCALE controls, jog the PEN switch to RECORD to mark the sheet.

d) Repeat Steps a) through c) as needed to accurately adjust the 1080 controls. Set the PICKUP switch to No. 2.

6. Set the 350 filter dial to exactly the following points: "100", "200", "300", and "400". For each dial setting, jog the PEN switch to RECORD to mark the sheet. The pen should precisely strike each corresponding line.

7. If the marks on the sheet tend to fall to the right of the lines, adjust R1401 CCW. If the marks fall to the left, adjust R1401 CW. For each R1401 trim adjustment, the 1080 X-ZERO and X-FULL SCALE controls must be recalibrated. Repeat steps 5, 6 and 7 as needed to properly adjust R1401.

8. Check the recorder frequency linearity by plotting the 20 Hz input signal as follows:

   a) Set the PICKUP INPUT switch to No. 1. The Amplitude Meter should indicate a full scale reading.

   b) Set the FILTER-OSC control to SHARP.

   c) Slowly rotate the filter dial from 50 to 500 and plot the curve on the test sheet. A typical SHARP mode plot for 20 Hz is shown in Figure 1-6, Page 1-14.

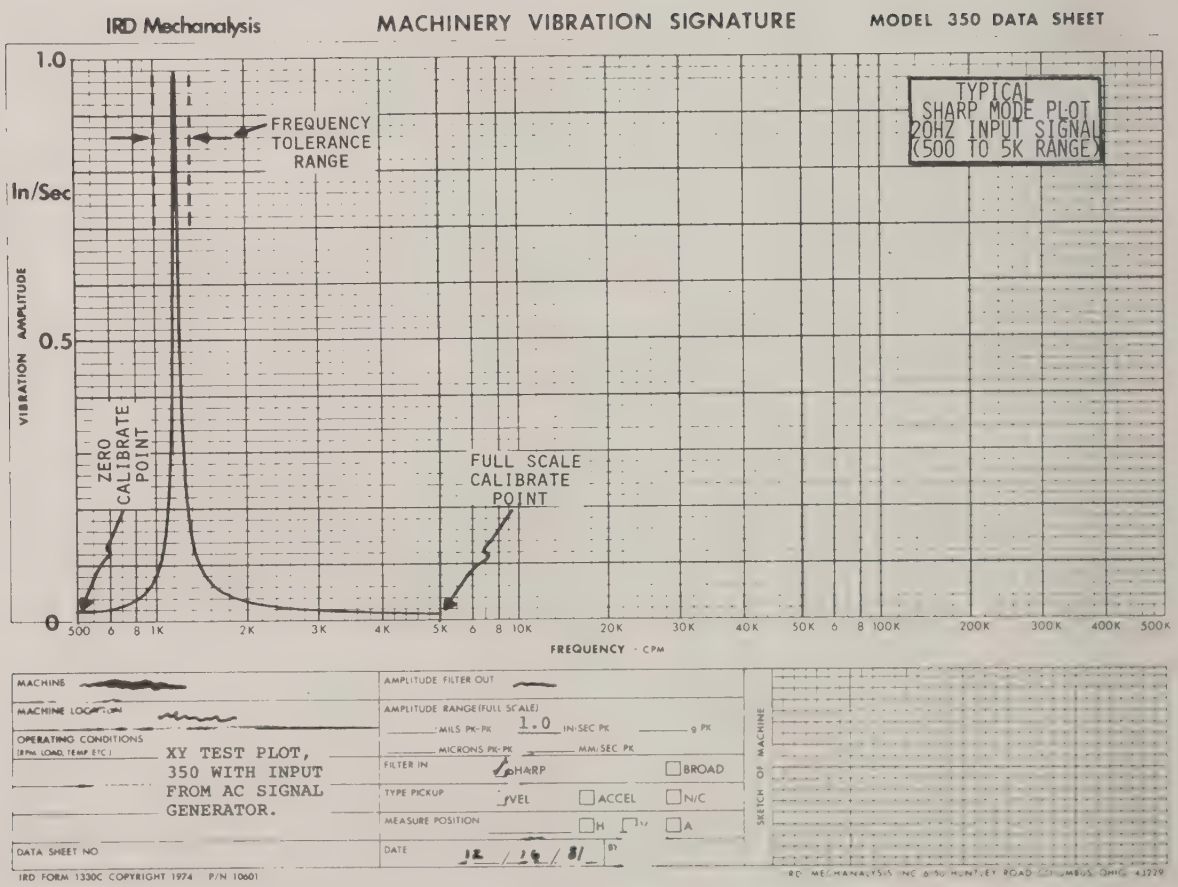


FIGURE 1-6 TYPICAL 350 SHARP MODE PLOT FOR 20 Hz

II SERVICE

2.1 GENERAL

This chapter contains a complete listing of the internal components and drawings showing the component locations. A Block Diagram and Schematic Diagram are also included which provide complete information on the 350 circuitry.

The component reference numbers (C201, R501, Q1002, etc.) listed on the parts lists and drawings match those listed on the Electrical Schematics. In general, the PC Board containing the circuit components in question is identified on both the Block Diagram and on the Electrical Schematics.

2.2 REPLACEMENT PARTS LISTS AND COMPONENT LOCATION ILLUSTRATIONS

The Replacement Parts Lists and PC Board Illustrations of the internal analyzer assemblies are shown on Pages 2-2 through 2-23 of this chapter. The reference numbers listed in the various parts lists and illustrations (R201, C301, etc.) are keyed to the corresponding circuits illustrated in Section 2.3. The parts lists and illustrations include information for replacement of discrete components on the PC Board, or for replacement of the entire PC Board.

TABLE 2-1 GENERAL PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	Fuse, 1/4 Amp Slo-Blo 3AG	5276
T1001	Transformer, Power	7900
---	Transformer, Converter	9103
---	Lamp, LED, Red	8352
---	Meter, Amplitude 0-200 Amp DC	8258
---	Meter, Frequency 0-500 Amp DC	12005
---	Switch, Rotary, 4 Position 5 Sec. - Filter Mode	7890
---	Switch, 10 Sec. 4 Position - Freq. Range	10578
---	Switch, 9 Sec. 4 Position - Power	7892
S1001	Switch, 2 Sec. 9 Position - Ampl. Range	7893
J13	Connector, Power Outlet	7898
J14	Connector, Power Inlet	1814
J15	Connector, Strobe 5 Pin	8618
---	Connector, 3 required BNC	10438
---	Connector Assembly, P.U. No. 1	4596
---	Connector Assembly, P.U. No. 2	4596
---	Battery, Ni-Cad 12.0 V	7896
---	Battery, Ni-Cad 6.0 V	7895
---	Converter/Battery Assembly	7935

TABLE 2-2 BUFFER/INTEGRATOR PC BOARD
SERIES 100 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly	7921
C101, 131	Capacitor, 250 MF, 3 Vdc, non-polarized	5023
C102, 103 164, 165	Capacitor, 0.01 MF, 100 Vdc	4572
C104, 105	Capacitor, 200 MF, 15Vdc, EL	3533
C106	Capacitor, 1.0 MF, 200 Vdc, 10%	3135
C132	Capacitor, 0.033 MF, 100 Vdc, 1%	4987
C161	Capacitor, 0.015 MF, 200 Vdc	5041
C162, 163	Capacitor, 750 pF 500V Vdc	7838
IC101,131,161	Semiconductor, IC L741LCN-PA, Low Noise	9692
P101, 131	Potentiometer, 500 ohms, multi-turn	7884
P161	Potentiometer, 250K ohms, multi-turn	9240
P162	Potentiometer, 50 ohms, multi-turn	7883
R101, 131	Resistor, 1K ohms, 1/8 W, 1%	7848
R102, 103	Resistor, 750 ohms, 1/8 W, 1%	7847
R104, 135,	Resistor, 2.21 Meg ohms, 1/2 W, 1%	7874
R133, 134, 166	Resistor, 10K ohms, 1/8 W, 1%	7859
R161	Resistor, 2.21K ohms, 1/8 W, 1%	7852
R162	Resistor, 15K ohms, 1/8 W, 1%	7860
R163, 164	Resistor, 10K ohms, 1/8 W, 1%	7868
R165	Resistor, 475K ohms, 1/4 W, 1%	7242
TP101	Test Jack, White Tip	7889
TP131	Test Jack, Yellow Tip	7887
TP161	Test Jack, Gray Tip	7888

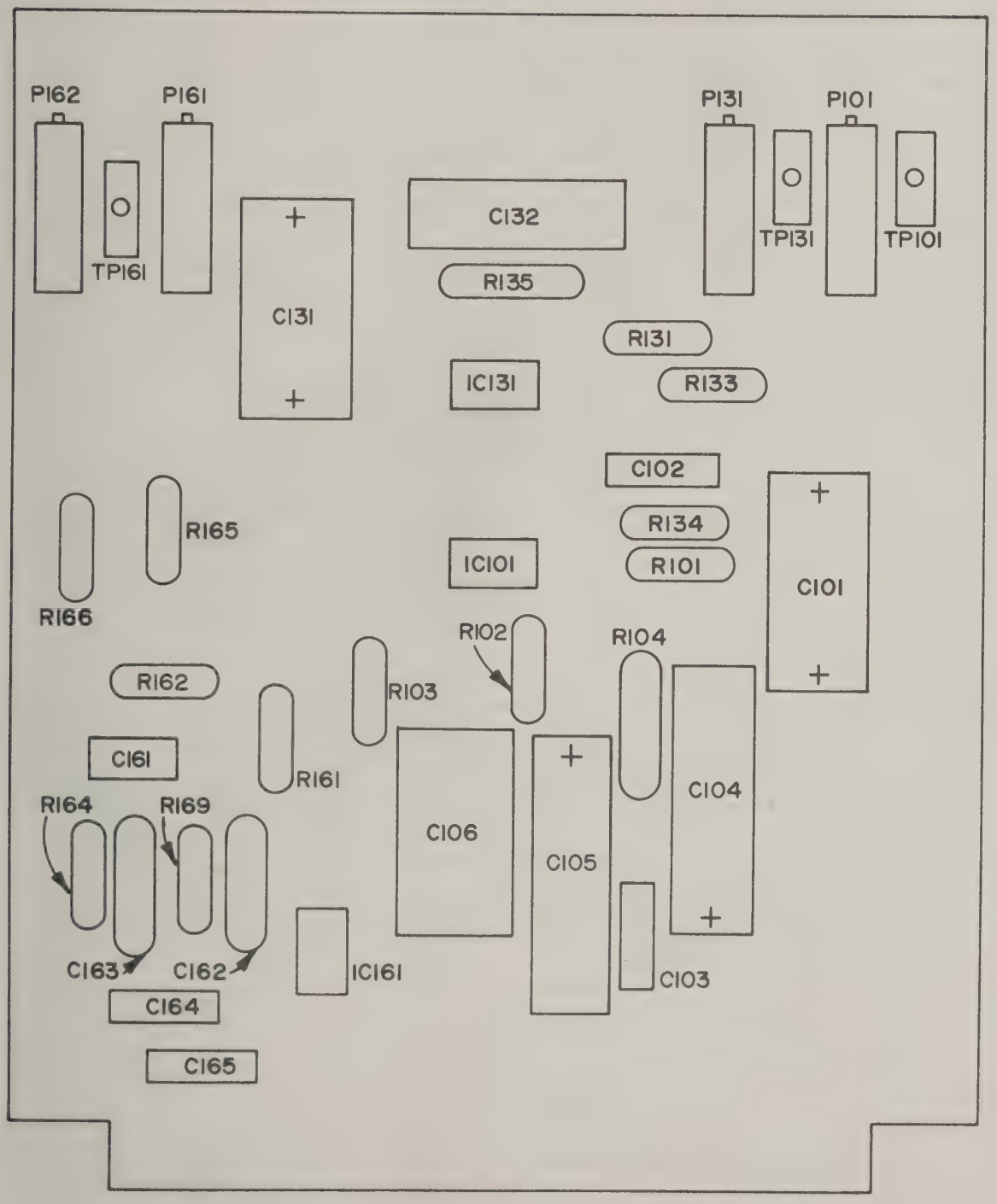


FIGURE 2-1 BUFFER/INTEGRATOR PC BOARD

TABLE 2-3 FILTER-METER AMP PC BOARD
SERIES 200 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly	8422
C201, 202	Capacitor, 0.01 MF, 100 V	4572
C203	Capacitor, 2200 PF 500V, 5%	13591
C204, 205	Capacitor, 200 MF, 16 Vdc, El.	3533
C231, 232	Capacitor, 25 MF, 12V (non-polarized)	5464
C233	Capacitor, 100 MF, 12 Vdc, El.	3605
C234	Capacitor, 4 MF, 50 Vdc, El.	5032
C235	Capacitor, 2000 MF, 3Vdc, El.	8397
C236	Capacitor, 200 MF, 3V (non-polarized)	5023
D201, 202 233, 234	Semiconductor, 1N67A, Diode	1380
D231, 232	Semiconductor, 1N914A, Diode	5398
IC201	Semiconductor, MC14396, IC	7827
IC231	Semiconductor, Mini, IC-741	8555
IC232	Semiconductor, MC1741 SCPI	14524
---	Pad, IC, 8-Pin	7767
P231 thru 239	Potentiometer, 50K ohms, Multi-turn	8338
R201, 202	Resistor, 1K ohm, 1/8 W, 1%	7848
R203	Resistor, 332K ohms, 1/8 W, 1%	7870
R204	Resistor, 392 ohms, 1/8 W. MF, 1%	13552
R205	Resistor, 22.1K ohms, 1/8 W, 1%	7863
R206, 232, 233, 234, 235, 237	Resistor, 10K ohms, 1/8 W, 1%	7859
R207, 208	Resistor, 215 ohms, 1/8 W, 1%	7844
R236	Resistor, 4.75K ohms, 1/8 W, 1%	7856
R239	Resistor, 7.15K ohms, 1/8 W, 1%	9297
TR201	Thermistor, 3K ohms, ±5%	5897

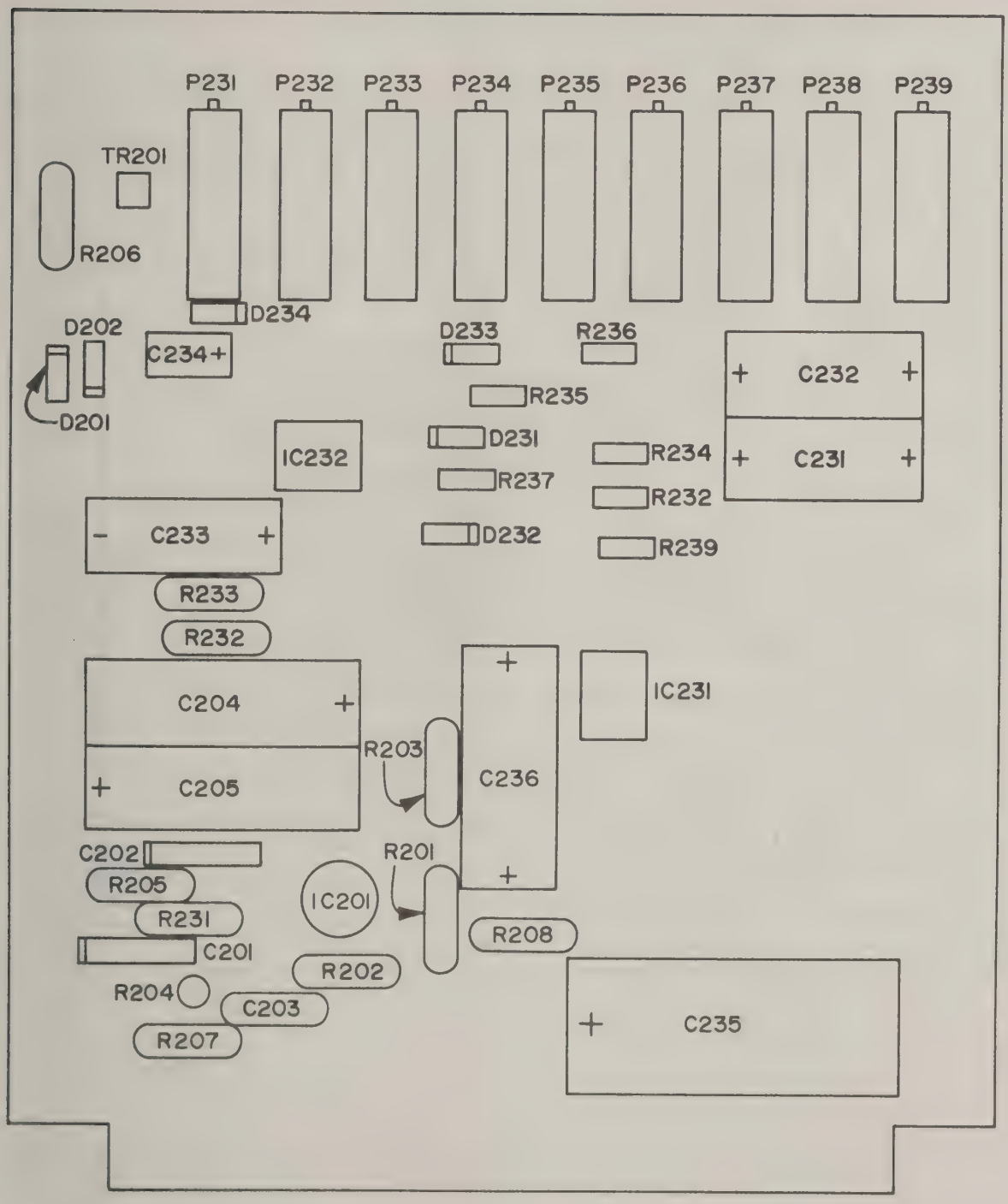


FIGURE 2-2 FILTER-METER AMP PC BOARD
SERIES 200

TABLE 2-4 FILTER PADDING PC BOARD
SERIES 300 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly	25778
C301, 302	Capacitor, 0.01 MF, 100 V	4572
C303	Capacitor, 2000 MF, 3 Vdc, El.	8397
C331	Capacitor, 25 MF, 6V (non-polarized)	3568
C332, 333	Capacitor, 0.0022 MF, 100 V	4571
C334, 338	Capacitor, 10 PF, 500V	7835
C335, 336	Capacitor, 200 MF, 25 Vdc, El.	3533
C337	Capacitor, 3 MF, 12 Vdc. El.	3530
D331, 332	Semiconductor, 1N5231, Zener 5.1V, Diode	5399
D333, 334	Semiconductor, 1N914A, Diode	5398
IC331, 332	Semiconductor, MC 1439G	7827
---	Pad, 8-Pin (for IC331 and 332)	7767
P301, 302, 303, 304	Potentiometer, 1K ohm	8336
Q301	Semiconductor, GK 101	7829
---	Pad, Dual FET MTG (for Q301)	7914
R301, 303	Resistor, 2K ohms, 1/8 W, 1%	7850
R302	Resistor, 3.32K ohms, 1/8 W, 1%	7854
R304	Resistor, 4.7 Meg ohms, 1/4 W, 5%	7876
R331, 332, 341, 344	Resistor, 6.81K ohms, 1/8 W, 1%	7857
R333, 334, 338, 346	Resistor, 1K ohms, 1/8 W, 1%	7848
R335, 340	Resistor, 475 ohms, 1/8 W, 1%	7845
R336	Resistor, 100 ohms, 1/8 W, 1%	7843
R337	Resistor, 10 Meg ohms, 1/4 W, 5%	7875
R339	Resistor, 150K ohms, 1/8 W, 1%	7869
R342, 343	Resistor, 475K ohms, 1/8 W, 1%	7871
R345	Resistor, 562K ohms, 1/4 W, 1%	7872
R347	Resistor, 2.7 Meg ohms, 1/4 W, 5%	7875
R348	Resistor, 1 Meg ohms, 1/8 W, 1%	9267

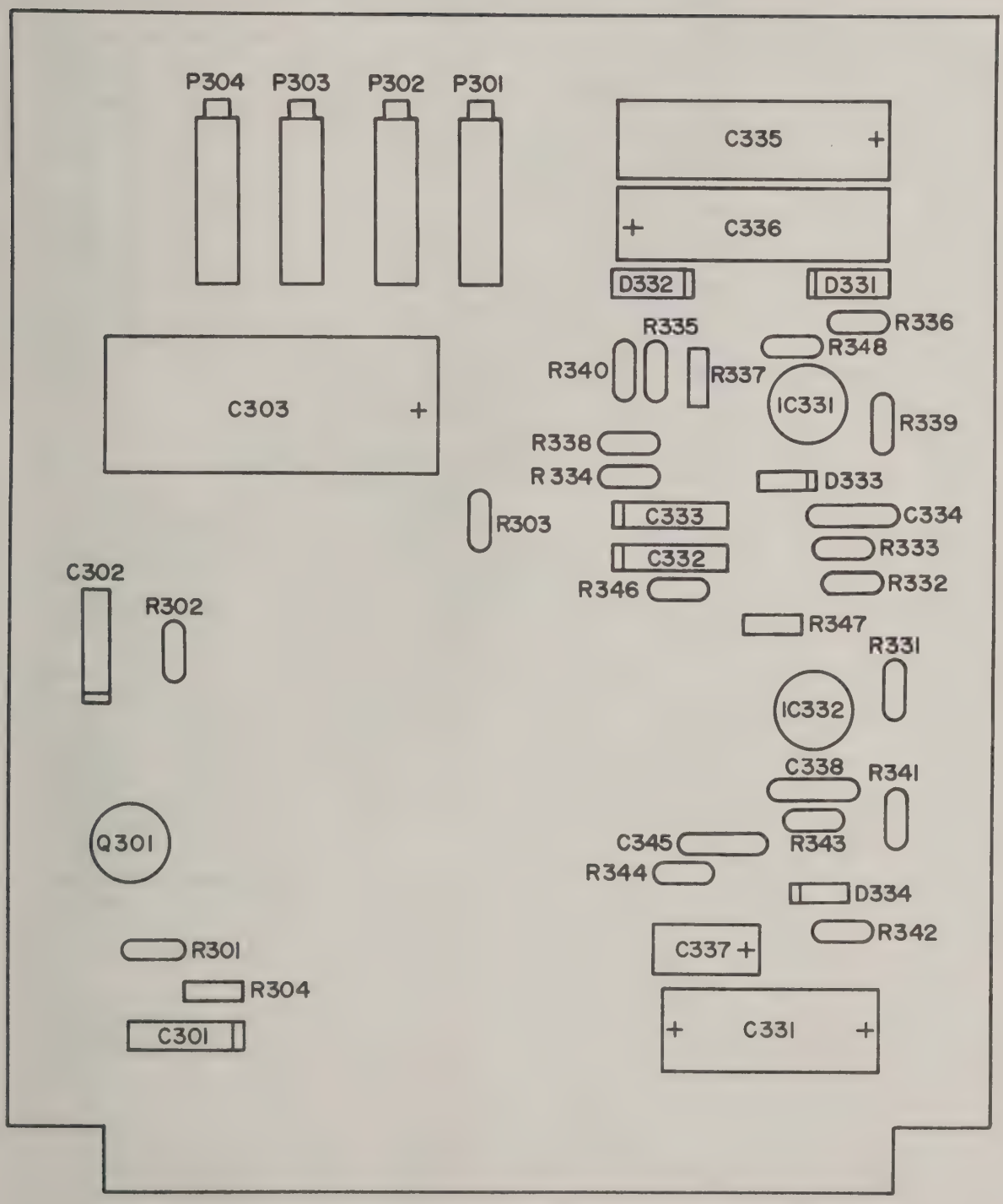


FIGURE 2-3 FILTER PADDING PC BOARD - 300

TABLE 2-5 LOGIC ASSEMBLY PC BOARD
SERIES 400 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly, DWG. C2-3408	7924
C401, 407, 431, 434	Capacitor, 0.01 MF, 100 Vdc	4572
C402	Capacitor, 0.033 MF, 100 Vdc	9001
C403	Capacitor, 0.33 MF, 100 Vdc	5037
C404	Capacitor, 3.0 MF, 100 Vdc	9002
C405	Capacitor, 10 MF, 200 Vdc	7839
C432, 406	Capacitor, 68 PF, 500 Vdc	7836
C408	Capacitor, 3.0 MF, 12 Vdc, El.	3530
C433	Capacitor, .30 MF, 50 Vdc, 1%	3503
C435	Capacitor, 0.001 MF, 100 Vdc	4951
D401, 431, 432	Semiconductor, IN914A, Diode	5398
P401	Potentiometer, 50K, Multi-turn	8338
P402, 403, 404	Potentiometer, 20K, Multi-turn	5476
P405, 406	Potentiometer, 10K, Multi-turn	5579
Q431, 401	Semiconductor, 2N3391	4826
Q432	Semiconductor, 2N3568	4583
IC431,401	Semiconductor, DM860IN	26331
R431, 405, 401	Resistor, 10K, 1/8 W, 1%	7859
R433, 402	Resistor, 1K, 1/8 W, 1%	7848
R403	Resistor, 1.82K, 1/8 W, 1%	9856
R434, 404	Resistor, 475K, 1/8 W, 1%	7871
R406	Resistor, 200 ohms, 1/8 W, 1%	8501
R432	Resistor, 37.4K, 1/8 W, 1%	7865
R435	Resistor, 3.32K, 1/8 W, 1%	7854
TP401	Test Jack, Red Tip	7886
TP402	Test Jack, Black Tip	7885

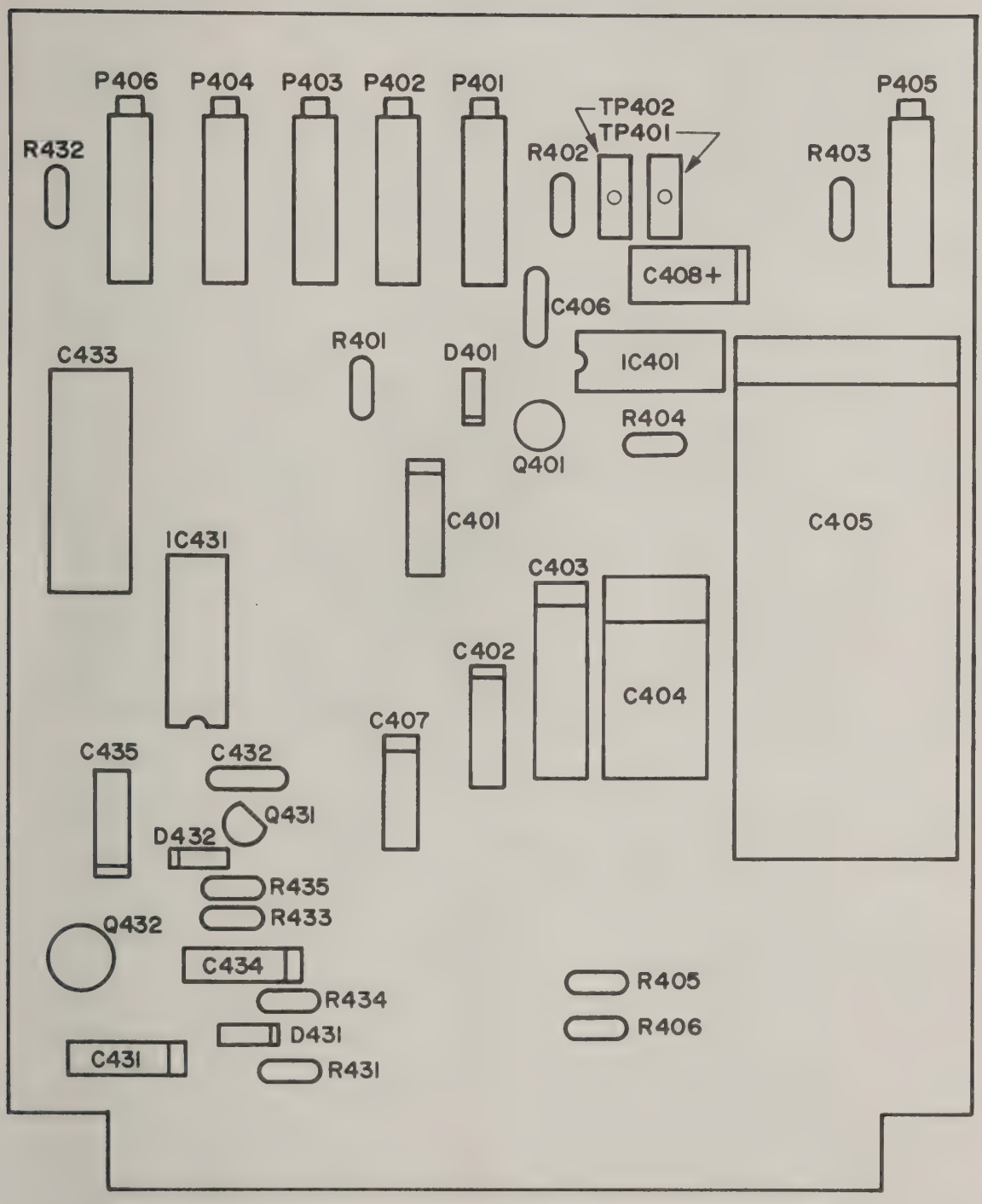


FIGURE 2-4 LOGIC ASSEMBLY PC BOARD - 400

TABLE 2-6 HIGH VOLTAGE AND 5 VOLT POWER SUPPLY
PC BOARD SERIES 500 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly, DWG. No. C2-3409	7925
C501	Capacitor, 10 MF, 500 Vdc, El.	4686
C531	Capacitor, 250 MF, 25 Vdc, El.	1491
C532	Capacitor, 100 PF, 500 Vdc	7837
D501	Semiconductor, FWL600	7834
D532, 531, 534	Semiconductor, IN4003, Diode	5948
D533	Semiconductor, FWL200	3565
IC531	Semiconductor, UA723	7830
Q531	Semiconductor, 2N1711	9190
P531	Potentiometer, 500 ohms, Multi-turn	7884
---	Heat Sink, (For Q531)	7939
R501	Resistor, 2.2 Meg, 1/2 W, 5%	1618
R531, 532,	Resistor, 750 ohms, 1/8 W, 1%	7847
R533	Resistor, 2.21K, 1/8 W, 1%	7852
R534	Resistor, 10 ohms, 1/8 W, 1%	7840
R535	Resistor, 180 ohms, 1-1/2 W, 5%	11681
R536	Resistor, 2.2K, 1/2 W, 5%	1591
R537	Resistor, 270 ohms, 3-1/4 W, 5%	7881
R538	Resistor, 680 ohms, 1 W, 5%	5678
R539	Resistor, 1.5 ohms, 1-1/2 W, 5%	7879
TP531	Test Jack, Red Tip	7886
TP532	Test Jack, Black Tip	7885

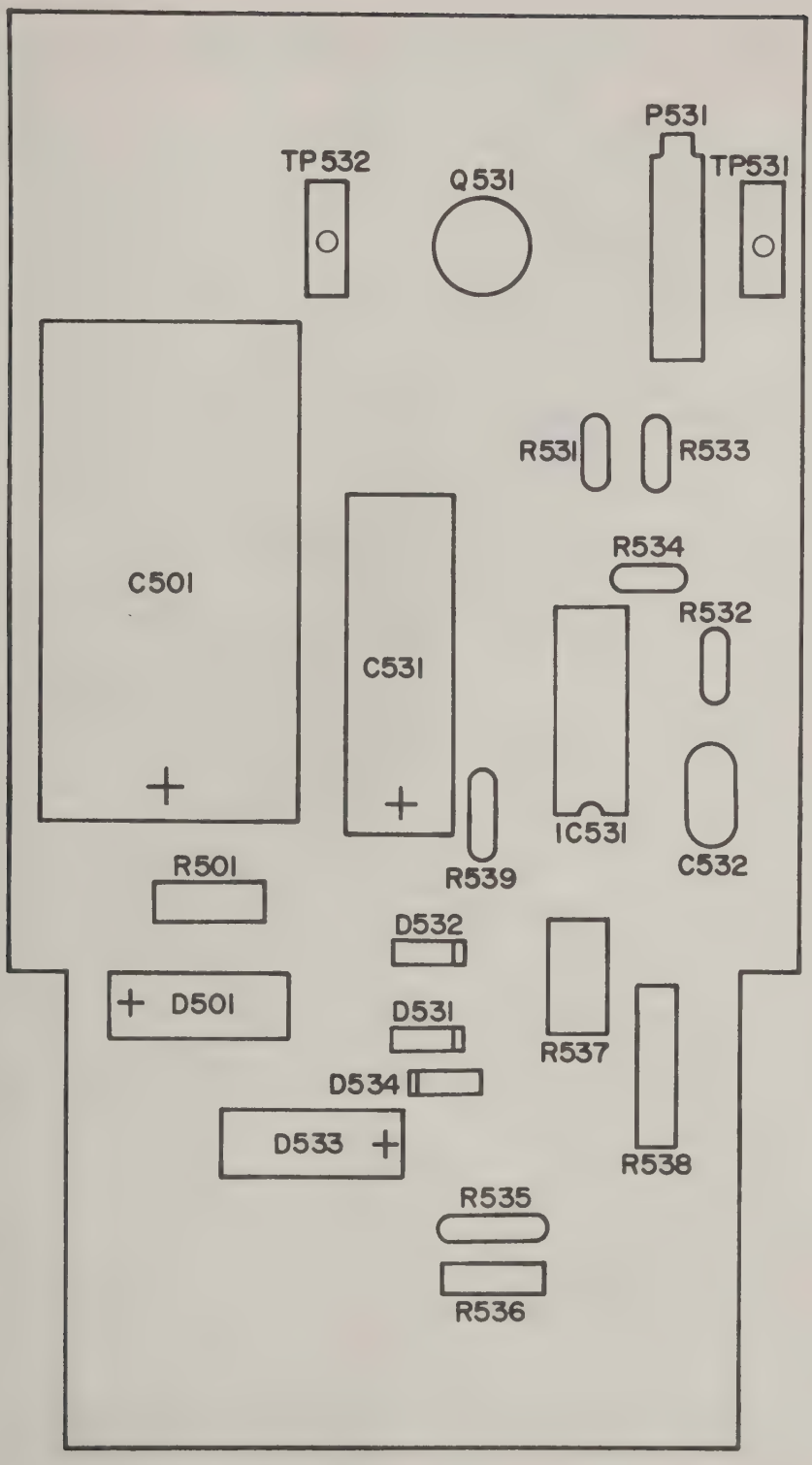


FIGURE 2-5 HIGH VOLTAGE AND 5 VOLT POWER SUPPLY PC BOARD - 500

TABLE 2-7 ±12 VDC POWER SUPPLY/SCR PC BOARD
SERIES 600 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly	7926
C601, 631	Capacitor, 250 MF, 25 Vdc, El.	1491
C602, 632	Capacitor, 100 PF, 500 Vdc	7837
C633	Capacitor, 0.047 MF, 200 Vdc	1446
C661	Capacitor, 0.01 MF, 100 Vdc	4572
C662	Capacitor, 0.047 MF, 400 Vdc	1434
D601, 631	Semiconductor, 1N4003, Diode	5948
D602	Semiconductor, 1N5231B, Zener	5399
D603	Semiconductor, FWL 200	3565
IC601, 631	Semiconductor, UA723	7830
P601, 631	Potentiometer, 500 ohms, multi-turn	7884
Q601	Semiconductor, NPN, D40D4	7832
Q631	Semiconductor, 2N3644	5091
Q632	Semiconductor, PNP, D41D4	7833
Q661	Semiconductor, 2N4187	4587
---	Heat Sink (2 required) for Q601 and 632	7902
R601, 631	Resistor, 1.21K ohms, 1/8 W, 1%	7849
R602, 632	Resistor, 2.21K ohms, 1/8 W, 1%	7852
R603	Resistor, 2.74K ohms, 1/8 W, 1%	7947
R604, 636	Resistor, 10 ohms, 1/8 W, 1%	7840
R605, 638	Resistor, 1.5 ohms, 1-1/2 W, 5%	7879
R606, 639	Resistor, 68 ohms, 5 W, 5%	8344
R607, 637	Resistor, 820 ohms, 1/2 W, 5%	3317
R608	Resistor, 27 ohms, 1/2 W, 5%	7878
R633	Resistor, 3.32K ohms, 1/8 W, 1%	7854
R634, 635	Resistor, 3.01K ohms, 1/8 W, 1%	7853
R661	Resistor, 220K ohms, 1/2 W, 5%	1609
R662	Resistor, 10K ohms, 1/8 W, 1%	7859
R663	Resistor, 180K ohms, 1/2 W, 5%	1608
R664	Resistor, 7500 ohms, 18 W, 10%	5118

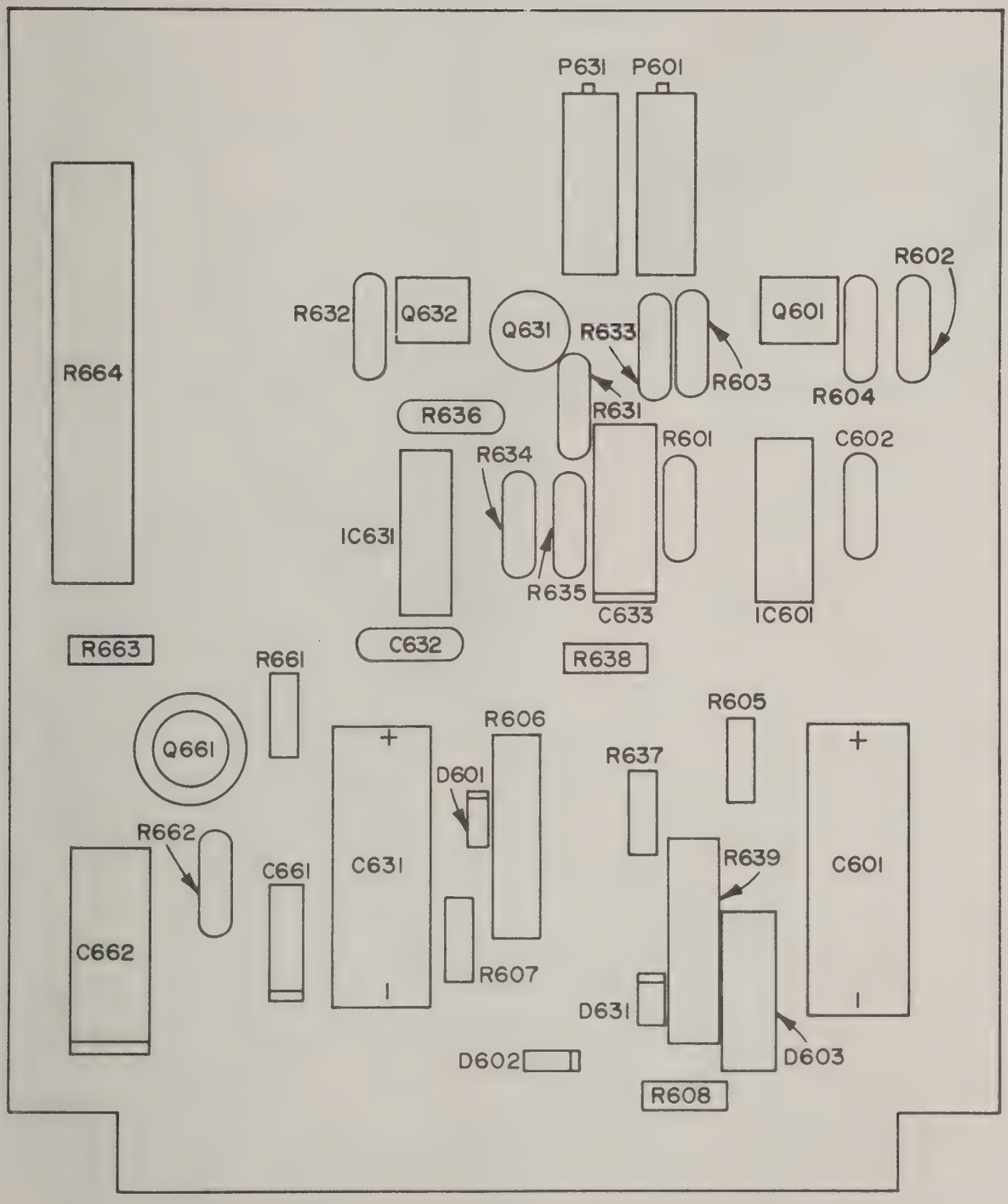


FIGURE 2-6 ±12 VDC POWER SUPPLY/
SCR PC BOARD - 600

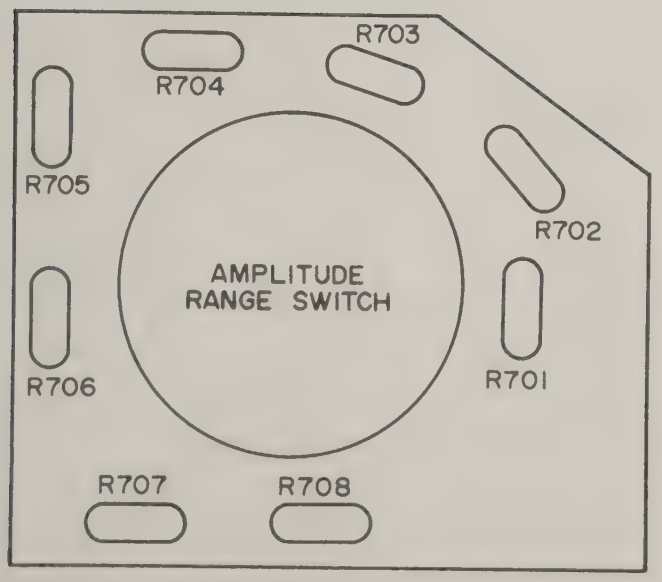


FIGURE 2-7 ATTENUATOR PC BOARD - 700

TABLE 2-9 TWIN T FILTER PC BOARD PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly, Dwg. C2-3413	7929
---	Capacitor, Filter Pot, Dwg. A3-373	8351
---	Capacitor, Padding, 200 pf. CM15E201J	9758

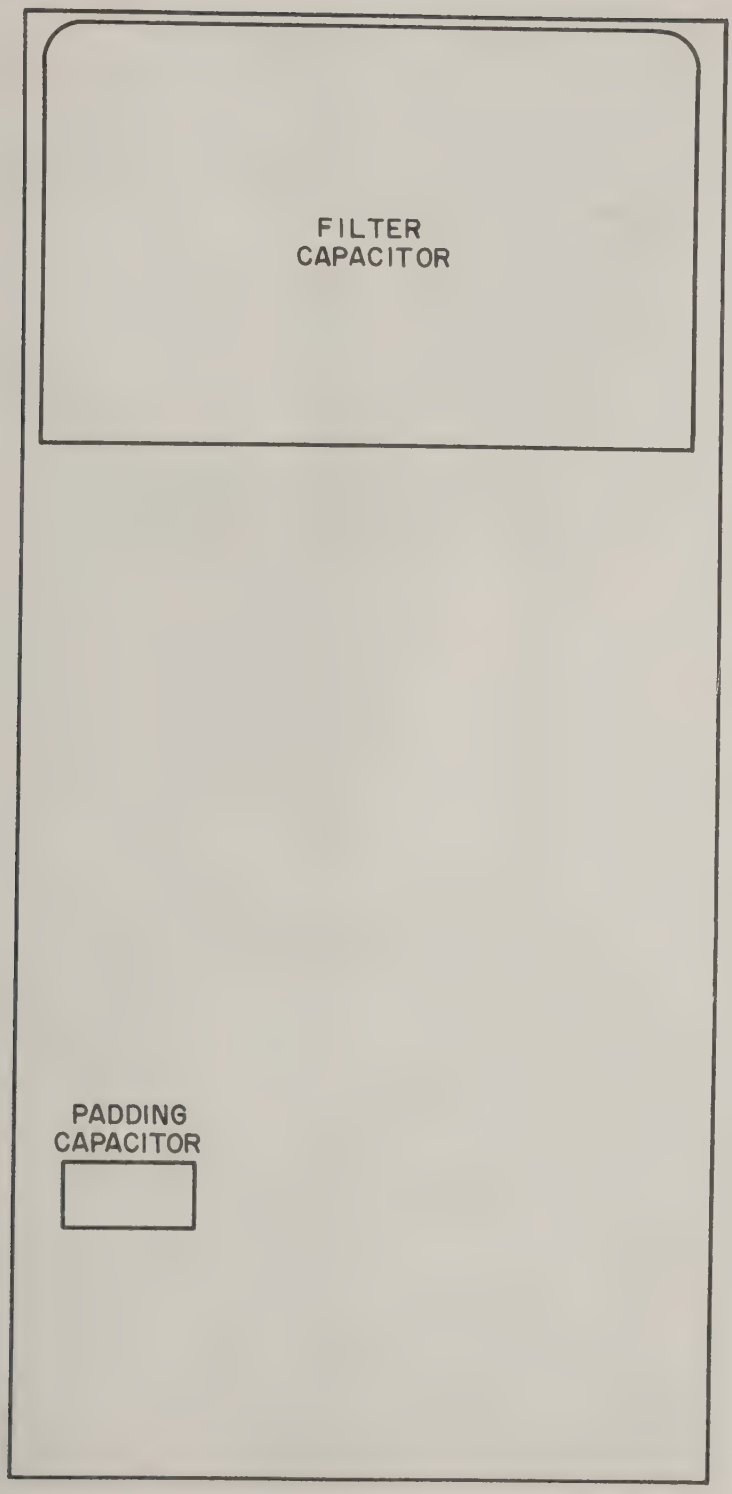


FIGURE 2-8 TWIN T FILTER PC BOARD

TABLE 2-10 MAIN PC BOARD ASSEMBLY
SERIES 1000 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly	8430
C1001	Capacitor, 0.01 MF, 1KV	4573
R1001, 1002	Resistor, 4.75K 1/8 W, 1%	7856
R1003	Resistor, 36 ohms, 10 W, 5%	7882
R1004	Resistor, 100 ohms, 1/2 W, 5%	1584
S1002	Switch, Filter	7890
S1003	Switch, Freq. Range/D3-5719	10578
S1004	Switch, Power/D3-3380	7892
---	Connector, 15-Pin, PC	7643
---	Connector, 22-Pin, PC (5 Required)	9348
---	Connector, 30-Pin, PC	9349

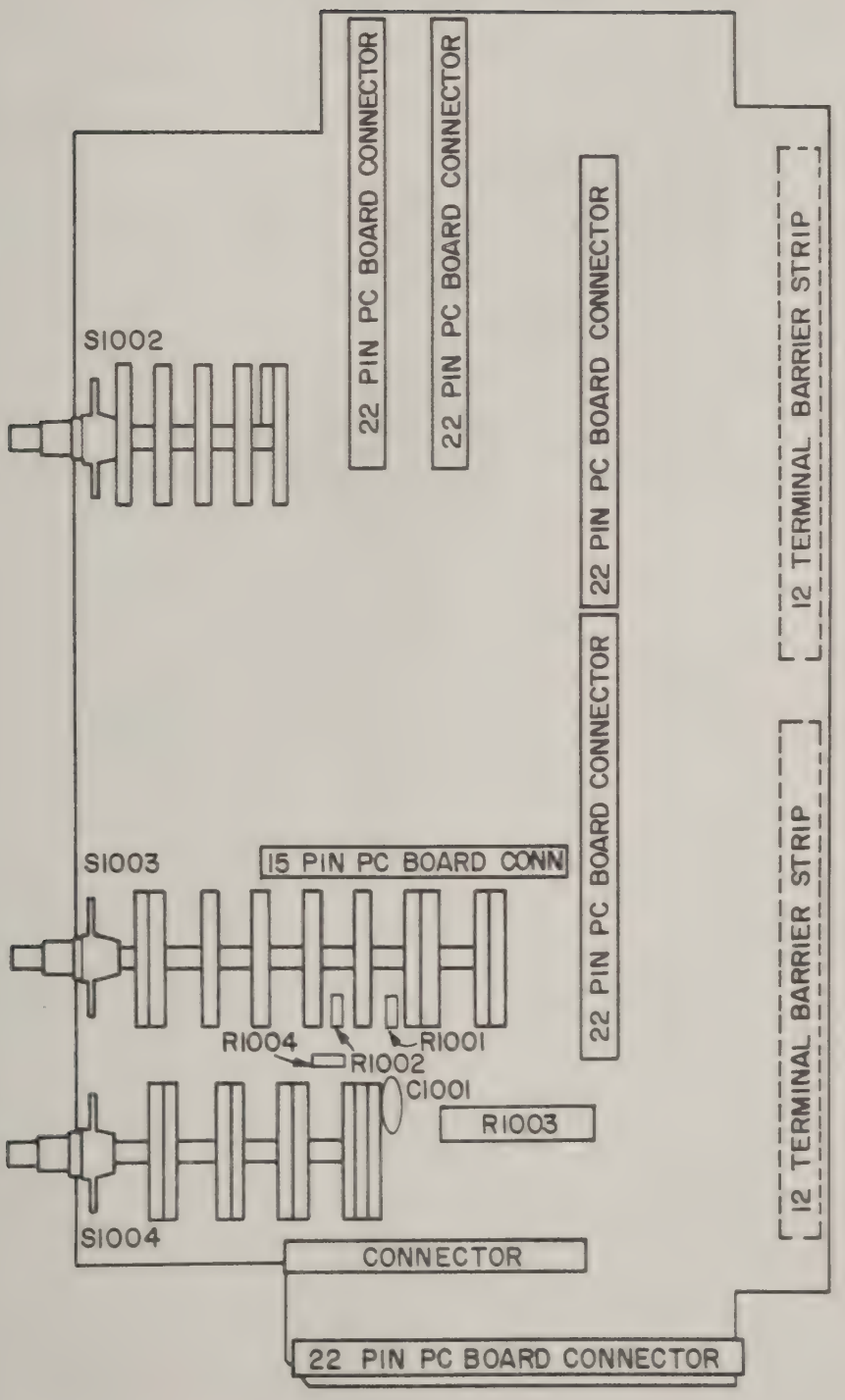


FIGURE 2-9 MAIN PC BOARD - 1000

TABLE 2-11 CONVERTER POWER PC BOARD
SERIES 1300 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly	7928
C1301	Capacitor, 10MF, 500 Vdc, El.	4686
D1301	Semiconductor, FWL 600 (Bridge Rect.)	7834
D1302	Semiconductor, 1N3279, Diode	4580
F1301	Fuse, 5 Ampere, 3AG, Slo-Blo	3849
K1301	Relay, SPDT, PC Mount	9142
Q1301 & 1302	Semiconductor, 2N3611	4584
R1301	Resistor, 47 ohms, 1/2 W, 5%	4337
---	Fuse Clip (2 Required)	8652
---	Resistor, 2.2 Meg ohms, 1/2 W, 5%	1618
---	Transformer, Potted Converter	9103

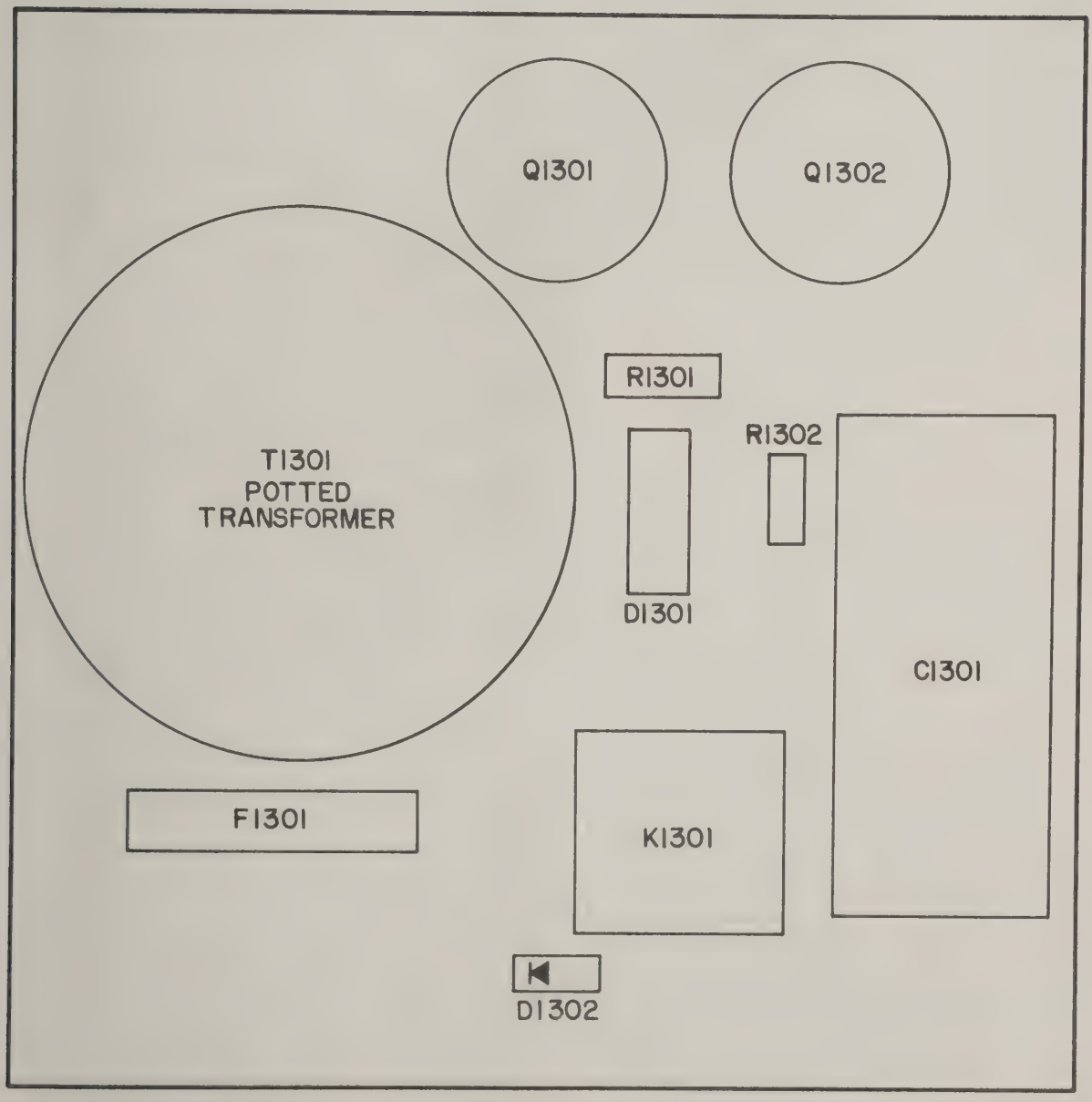


FIGURE 2-10 CONVERTER POWER PC BOARD - 1300

TABLE 2-12 XY PLOTTER PC BOARD
SERIES 1400 PARTS LIST

REF. NO.	DESCRIPTION OF PART	PART NO.
---	PC Board Assembly	19412
C1401	Capacitor, 25 MF, 12V	3532
C1402	Capacitor, 50 MF, 50V	5034
C1403	Capacitor, 4 MF, 50V	5032
IC1401	Semicondutor, MC3476P1	16203
P1401	Pot, 1K ohm, 3/4 W, 10%	8336
R1401	Resistor, 4990 ohm, 1/8 W, 1%	9105
R1403, 1405	Resistor, 10K 1/8 W, 5%	7859
R1404	Resistor, 51.1 ohm, 1/8 W, 1%	9902
R1406	Resistor, 1M ohm, 1/8 W, 5%	9267

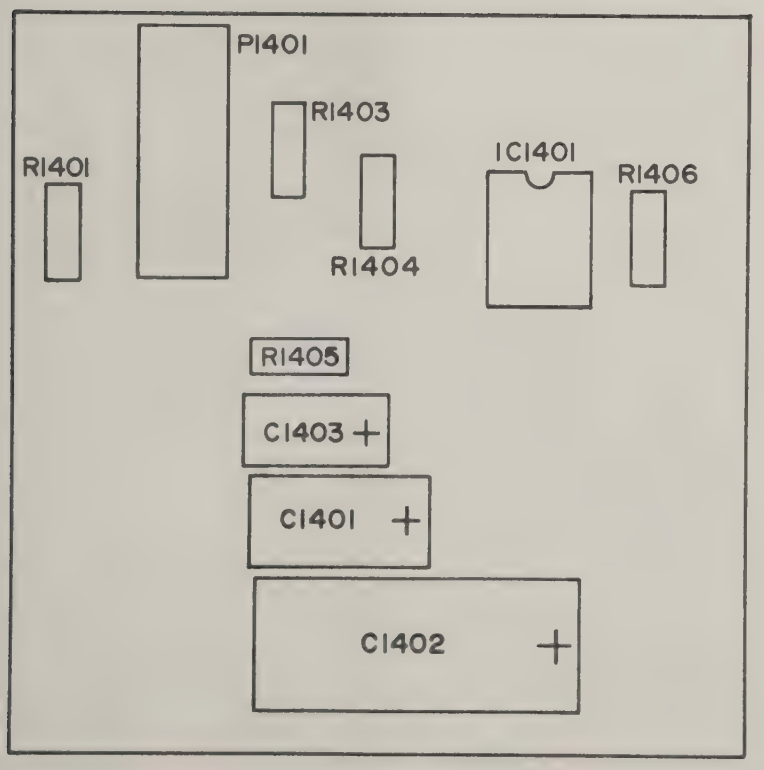
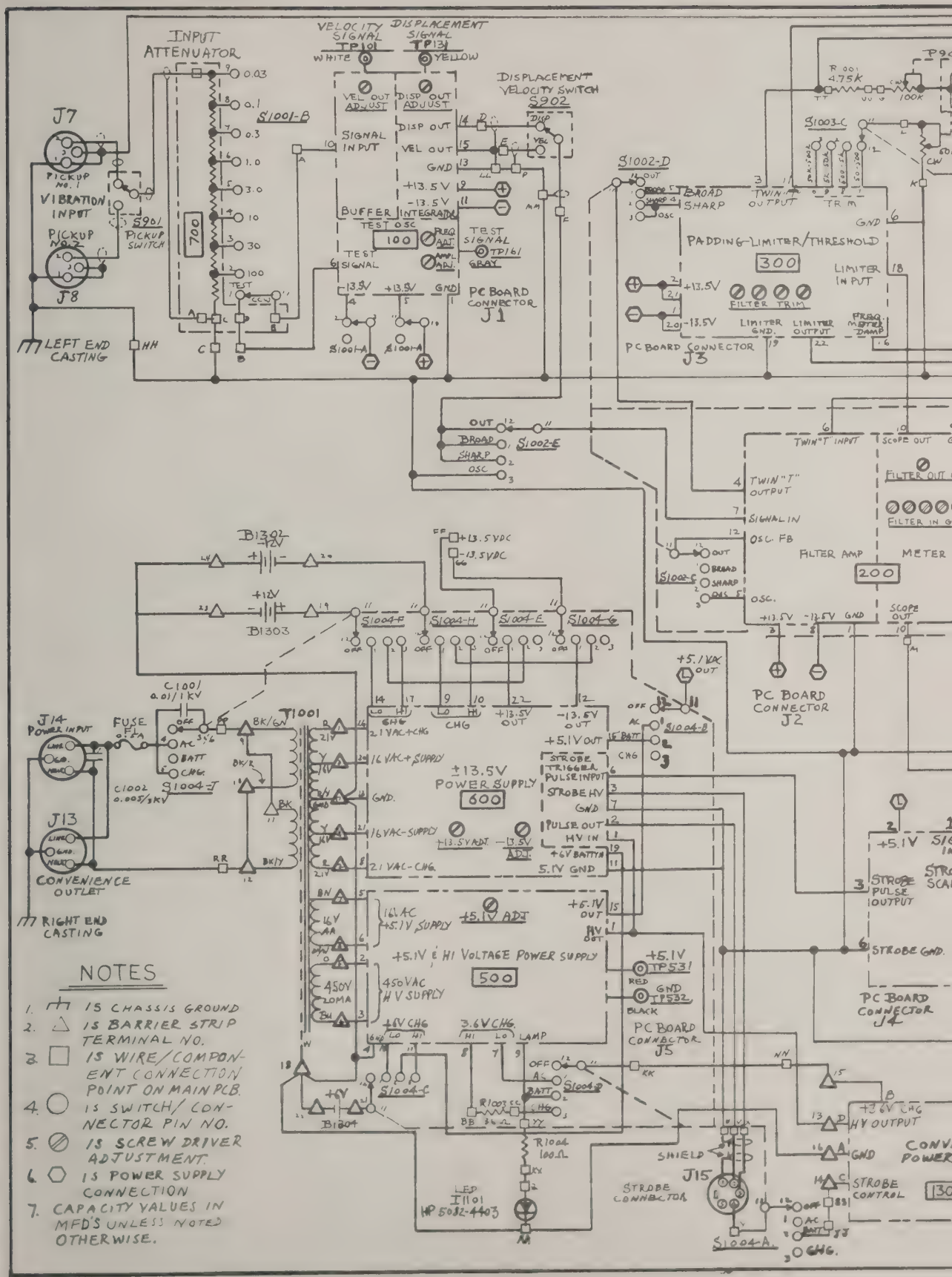


FIGURE 2-11 XY PLOTTER PC BOARD - 1400

2.3 BLOCK DIAGRAM

The Block Diagram of the various Model 350 Vibration Analyzer and external device circuits is provided in Figure 2-12. This diagram shows the circuit paths of the various signal voltages, and should be used in conjunction with the electrical schematic diagram shown in Section 2.4 and the component layout illustrations shown in Section 2.2.

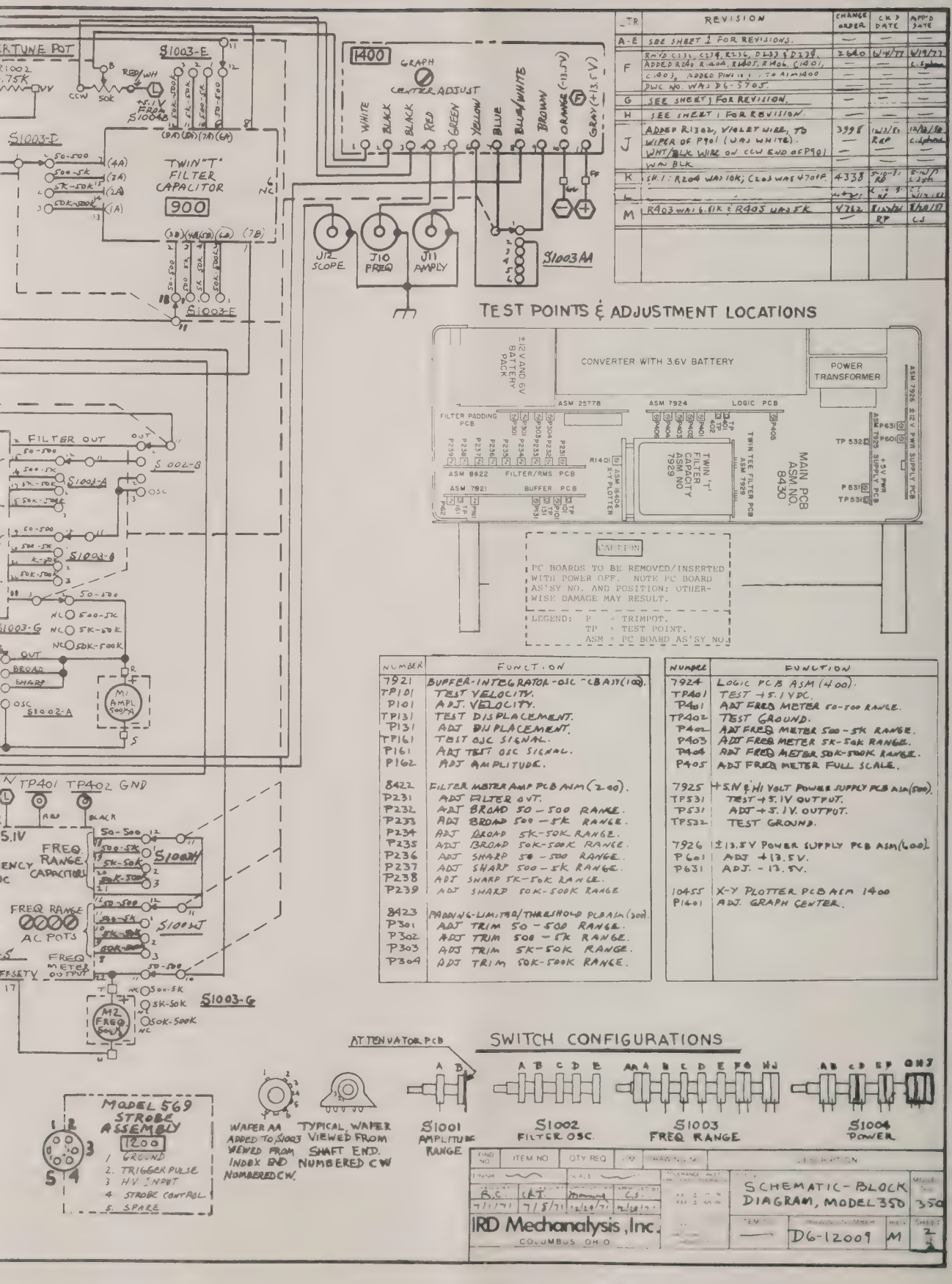
The Block Diagram is provided to help the user obtain an understanding of the circuit functions that form the various output signals and indications. Signal voltage values are included in the diagram where possible. In addition, the functional name of each PC Board and the PC Board Assembly Number shown in Section 2.2 are also included. The physical locations of the major PC Boards and the calibration setup controls are shown in Figure 1-1, Page 1-2.



NOTES

1. ⏚ IS CHASSIS GROUND
2. △ IS BARRIER STRIP TERMINAL NO.
3. □ IS WIRE/COMPONENT CONNECTION POINT ON MAIN PCB.
4. ○ IS SWITCH/CONNECTOR PIN NO.
5. ⊘ IS SCREW DRIVER ADJUSTMENT.
6. ⬡ IS POWER SUPPLY CONNECTION
7. CAPACITY VALUES IN MFD'S UNLESS NOTED OTHERWISE.

FIGURE 2-12 MODEL 350 BLOCK DIAGRAM



TR	REVISION	CHANGE ORDER	CK'D DATE	APP'D DATE
A-E	SEE SHEET 1 FOR REVISIONS.	—	—	—
F	RM'D C131, C134, R236, D233 & D238. ADDED R140 R1404, R1405, R1406, C1401, C1403, ADDED PIN 18 TO A1M1400 DWG. NO. WAS D6-5705.	2640	6/4/71	6/9/71
G	SEE SHEET 1 FOR REVISION.	—	—	—
H	SEE SHEET 1 FOR REVISION.	—	—	—
J	ADDED R1302, VIOLET WIRE, TO WIPER OF P901 (WAS WHITE). WHT/BLK WIRE ON CCW END OF P901 WAS BLK.	3998	12/22/71 R&P	12/30/71 C.Lytle
K	SH. 1: R206 WAS 10K; C203 WAS 4700pF.	4338	7/18/72 RB	8/7/72 C.Lytle
L		4472	8/28/72 RP	9/12/72 CJ
M	R403 WAS 6.81K & R405 WAS 5K.	4712	11/15/72 RP	11/28/72 CJ

TEST POINTS & ADJUSTMENT LOCATIONS

CAUTION

PC BOARDS TO BE REMOVED/INSERTED WITH POWER OFF. NOTE PC BOARD ASS'Y NO. AND POSITION; OTHERWISE DAMAGE MAY RESULT.

LEGEND: P = TRIMPOT.
TP = TEST POINT.
ASM = PC BOARD ASS'Y NO.

NUMBER	FUNCTION
7921	BUFFER-INTEGRATOR-OSC PCB ASS'Y (100).
TP101	TEST VELOCITY.
P101	ADJ. VELOCITY.
TP131	TEST DISPLACEMENT.
P131	ADJ DISPLACEMENT.
TP161	TEST OSC SIGNAL.
P161	ADJ TEST OSC SIGNAL.
P162	ADJ AMPLITUDE.
8422	FILTER METER AMP PCB ASM (200).
P231	ADJ FILTER OUT.
P232	ADJ BROAD 50 – 500 RANGE.
P233	ADJ BROAD 500 – 5K RANGE.
P234	ADJ BROAD 5K-50K RANGE.
P235	ADJ BROAD 50K-500K RANGE.
P236	ADJ SHARP 50 – 500 RANGE.
P237	ADJ SHARP 500 – 5K RANGE.
P238	ADJ SHARP 5K-50K RANGE.
P239	ADJ SHARP 50K-500K RANGE
8423	PADDING-LIMITER/THRESHOLD PCB ASM (200).
P301	ADJ TRIM 50 – 500 RANGE.
P302	ADJ TRIM 500 – 5K RANGE.
P303	ADJ TRIM 5K-50K RANGE.
P304	ADJ TRIM 50K-500K RANGE.

NUMBER	FUNCTION
7924	LOGIC PCB ASM (400).
TP401	TEST +5.1 VDC.
P401	ADJ FREQ METER 50-500 RANGE.
TP402	TEST GROUND.
P402	ADJ FREQ METER 500 – 5K RANGE.
P403	ADJ FREQ METER 5K-50K RANGE.
P404	ADJ FREQ METER 50K-500K RANGE.
P405	ADJ FREQ METER FULL SCALE.
7925	±5V & +11 VOLT POWER SUPPLY PCB ASM (500).
TP531	TEST +5.1V OUTPUT.
P531	ADJ +5.1V. OUTPUT.
TP532	TEST GROUND.
7926	±13.5V POWER SUPPLY PCB ASM (600).
P601	ADJ +13.5V.
P631	ADJ. -13.5V.
10455	X-Y PLOTTER PCB ASM 1400
P1401	ADJ. GRAPH CENTER.

SWITCH CONFIGURATIONS

S1001 AMPLITUDE RANGE

S1002 FILTER OSC.

S1003 FREQ RANGE

S1004 POWER

MODEL 569 STROBE ASSEMBLY 1200

1. GROUND
2. TRIGGER PULSE
3. HV INPUT
4. STROBE CONTROL
5. SPARE

WAFER AA ADDED TO S1003 VIEWED FROM INDEX END NUMBERED CW

TYPICAL WAFER VIEWED FROM SHAFT END. NUMBERED CW

FIND NO	ITEM NO	QTY REQ	MATERIAL	DESCRIPTION
FINISH		SCALE	TOLERANCE UNLESS OTHERWISE SPECIFIED	SCHEMATIC-BLOCK DIAGRAM, MODEL 350
B.C.	C.J.	Manning	C.S.	MODEL NO. 350
7/1/71	7/5/71	12/29/71	2/29/72	
IRD Mechanalysis, Inc. COLUMBUS OHIO				REV — DWG NO. D6-12009 REV M SHEET 2

MEMORANDA

2.4 ELECTRICAL SCHEMATICS

The Electrical Schematic drawing of the various analyzer circuits is shown on Page 2-29. Where possible, voltage values and signal waveforms are included on the Electrical Schematic drawing. This drawing should be used in conjunction with the Block Diagram shown in Section 2.3 to help in analyzing the 350 circuits, and to pinpoint circuit faults to specific electrical components.

MEMORANDA

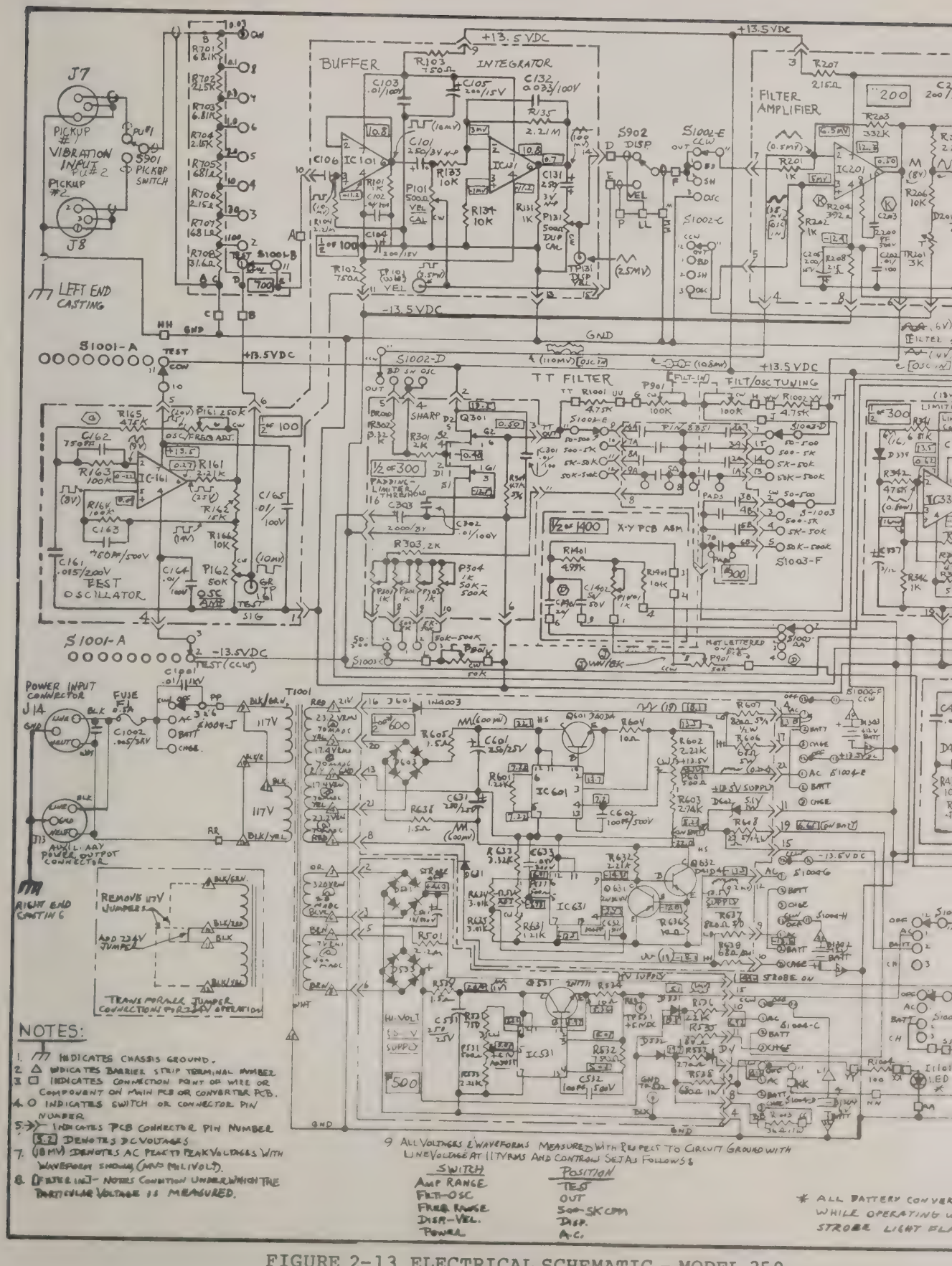
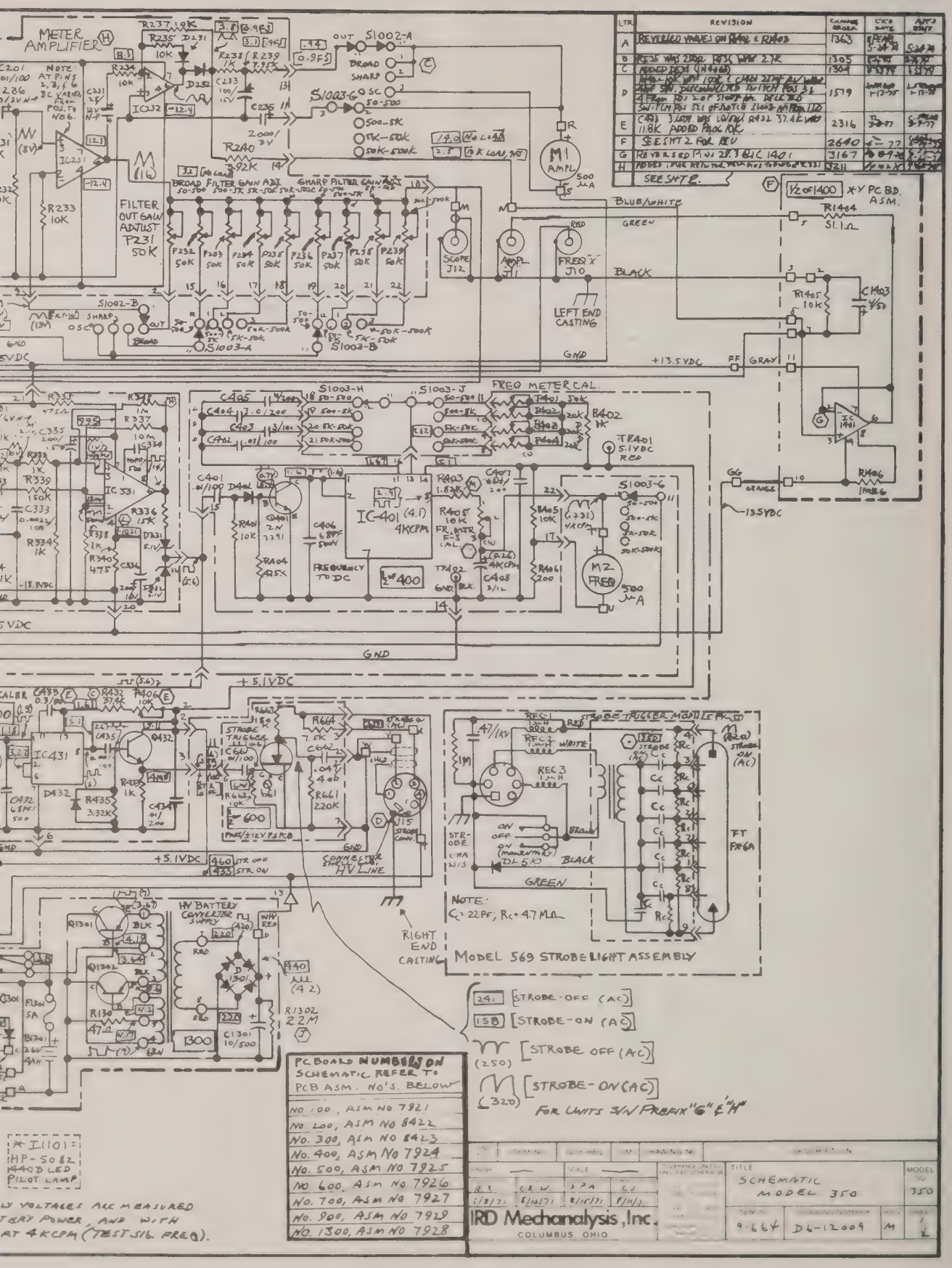


FIGURE 2-13 ELECTRICAL SCHEMATIC - MODEL 350


METER AMPLIFIER
FILTER OUT GAIN ADJUST P231 50K
BROAD FILTER GAIN ADJ
SHARP FILTER GAIN ADJ
FREQ METER CAL.
IC-401 (4.1) 4KCPM
FREQUENCY TO DC
M1 AMPL
M2 FREQ
LEFT END CASTING
RIGHT END CASTING
+13.5VDC
+5.1VDC
GND
BLUE/WHITE
GREEN
BLACK
GRAY
ORANGE
½ OF 1400 X-Y PC BD. ASM.
MODEL 569 STROBE LIGHT ASSEMBLY
NOTE: C = 22 PF; R = 47 MEG
HV BATTERY CONVERTER SUPPLY
PC BOARD NUMBERS ON SCHEMATIC REFER TO PCB ASM. NO'S. BELOW
NO. 100, ASM NO 7921
NO. 200, ASM NO 8422
NO. 300, ASM NO 8423
NO. 400, ASM NO 7924
NO. 500, ASM NO 7925
NO. 600, ASM NO 7926
NO. 700, ASM NO 7927
NO. 900, ASM NO 7928
NO. 1300, ASM NO 7928
[STROBE-OFF (AC)]
[STROBE-ON (AC)]
[STROBE OFF (AC)]
[STROBE-ON (AC)]
FOR UNITS S/N PREFIX "G" & "H"
IRD Mechanalysis, Inc.
COLUMBUS, OHIO
SCHEMATIC MODEL 350
D6-12009

APPENDIX A-1 MANUAL MODIFICATION RECORD

The following table contains a summary of the calibration, specification, and component changes included in this manual. The higher change letter shown in the table is also listed on the face page of this manual.

MANUAL MODIFICATION RECORD

CHANGE LETTER	SUMMARY OF CHANGE	CHANGE DATE	ECO REF. NUMBER

MP MASTER
MA34742